SYSTEM 310 FAMILY CE HANDBOOK

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CHAPTER 1
STANDARD/SUPPORTABLE CONFIGURATIONS

The major components of the standard versions of the SYP 310 are assembled in Table 1-1. Chassis and interconnecting components are not listed. The power consumption data are included for assessing power limitations.

Table 1-1. Configuration Guide

310 Dash Number	Chassis					CPU				CPU Options							Peripheral Controllers				Peripherals								Memory						Communications		
	LBX	220W PS	270W PS	360W PS	86/30	86/35	286/12	286/10	80287	337 Math	304 RAM	286/10 FF/W	F/W SCT 300F	F/W SCT 300W	286/10 WFW	213	214	215G	218A	217C	10MB Winl	19MB Winl	40MB Winl	86MB Winl	140MB Winl	320K FHFD	320K HHFD	¼ Inch Tape	056CX	012B	010CX	012CX	020CX	101EX	354 Comm	544	552	188/48
1		1			1				1				1					1	1		1					1[1]											
2		1			1					1	1			1				1	1							1											
2A		1			1					1	1			1				1	1			1				1[1]											
3		1			1					1				1				1	1		1					1				1							
3A		1			1					1				1				1	1			1				1[1]			1								
4	1	1						1	1			1						1	1							1[1]				1							
5[5]	1	1						1						1				1	1		1					1					1						
6	1	1						1				1							1[A]								2		1								1
7	1	1						1				1							1[A]								2				1						
8	1	1						1				1		1				1	1		1						2				1						
9	1	1						1				1		1				1	1		1						2		1		1						
14		1		1									1						1							1											
16		1			1					1	1			1				1	1		1					1											
17	1	1						1	1					1				1	1			1				1[1]					1						
17B	1		1					1	1					1				1	1			1				1[2]					1						
17C	1			1			1		1					1			1		1			1				1[2]											
17S	1	1						1							1			1	1			1				1					1						
22	1		1					1							1			1	1			1				2					1[R]					1
35		1				1				1	1							1	1			1				1[1]											
40	1		1					1	1									1	1				1			1[2]				1[R]							
40B	1			1			1		1					1			1		1				1			1[2]											
41	1		1					1	1					1				1	1				1							1[M]							1
41B	1			1			1		1					1			1		1				1														1
42	1			1			1		1					1			1		1				1					1									1
44	1		1					1	1					1				1	1				1			1[1]				1[M]				1		
44B	1			1			1		1					1			1		1				1			1									1		
46	1		1					1	1					1				1	1	1						1[1]						1		2			1
50	1		1					1	1					1				1	1							1[2]					2[M]					
82	1			1			1		1					1			1									1	1						1	2			1
88	1			1			1		1					1			1									1	1						1				1
90		1																																			
91		1																																			
92	1		1																																		
142	1			1			1		1					1			1							1		1	1						1				1
145	1			1			1		1					1			1							1		1	1						1		1		1
Power Consumption (A)																																					
+5					4.8	3.9[T]	7.8	7.6	[1]	.5	1.4		.3	.3		1 4	3.6	4.6	1.6	1.5		1.5[W]	1 5[W]			75	.75	.6	6 4	4.5	6.5	6 6[P]	6 7		5	2 7		7 3
+ 12/mof	.3				.1	01	.01	.1														1.7/3 5	2.0/5.0			1.0/1.8	1.0/1 3	1 6/4.4						.1	33		2
− 12	.3		.3		.1	.006	.01	1																										.1	2		2

Footnotes [T] Includes 337A & 304 [W] +5 add 7.4A Intercont. for Winl [M] 1 megabyte [P] add 6.6A/512 kb over 512 kb [1] included in μP board [A] non "A" version [R] 8.96k

CHAPTER 2
BASE SYSTEMS

Chapter 2 is formatted to include information for system peripherals in the format of Table 2-1.

Table 2-1. Chapter Format

Specifications
- Electrical Characteristics
  - DC, AC
- Interface
  - Bus, Serial, Parallel
- Memory

Functional Description

Removal and Installation Instructions
- Jumpering

Product History
- Version levels

2.1 Chassis

Specifications

DC Electrical load

.33 amps + 12VDC
.33 amps − 12VDC

AC Specifications

198 to 264 VAC
47 to 63 Hz

NOTE

Maximum power consumption is 523 watts.

Physical Specifications

Height 6.5 in
Width 17. in
Depth 20. in
Weight 40 lbs

Interface

Bus Interface
- IEEE 796 MULTIBUS interface
- Ripple voltage exception
  - 100 Mv pp @ 5VDC
  - 120 Mv pp @ + 12VDC and − 12VDC
- Serial Interface
  - RS-232C
- Parallel Interface
  - Centronics compatible

Temperature

Operating
- 10–35°C (using flexible diskettes)
- 0–46°C (using a Winchester)

Nonoperating
- 10–51°C (using flexible diskettes)
- 22–48°C (not using flexible diskettes)

Humidity (System Operating)

Relative humidity 20% to 80% (noncondensing)
Maximum wet bulb 78.8°F (26°C)

Functional Description

The system chassis contains the sheet metal, cooling fans and backplane for protecting system operation. Component layout is shown in Figures 2-1 and 2-2. The block diagram of overall system functionality is located in Figure 2-3.

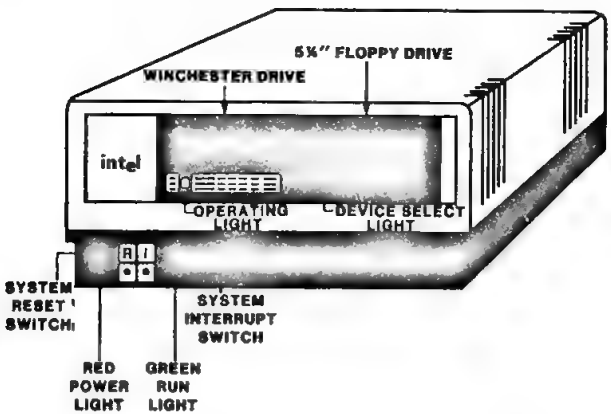


Figure 2-1. Front View of the System 310

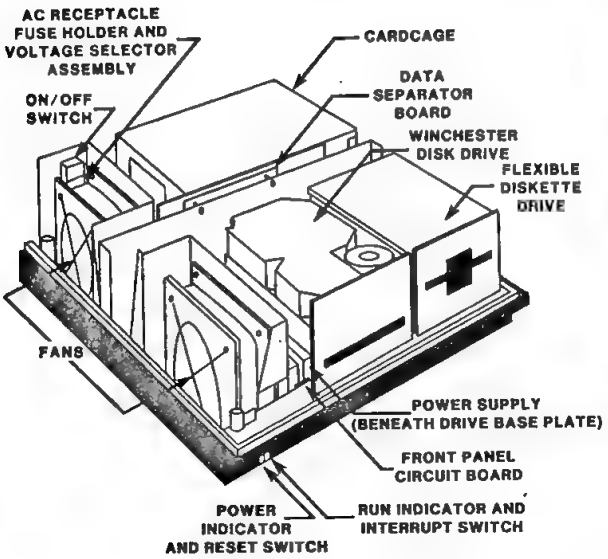
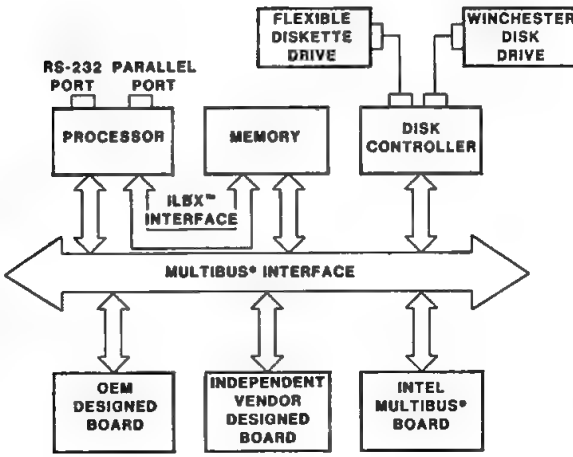


Figure 2-2. Major System 310 Components

Installation

The System 310 should have the following two items packed inside the shipping carton:

1. A plastic-wrapped package containing:
   a. installation manual
   b. customer letter
   c. 9″ x 13″ anti-static bag containing the AC power cord
   d. and a second anti-static bag containing the rubber mounting feet and a normal-blo, 250V fuse
2. the base processor unit.



*AVAILABLE ONLY ON iSBC® 286/10, iSBC® 012CX, AND iSBC® 0565CX BOARDS

Figure 2-3. General Block Diagram of System 310

Setting the Voltage

Before attaching a terminal and powering up a the System 310, check the voltage selector mounted on the AC back panel (Figure 2-4). The voltage selector must be set to the proper line voltage and current rating. Refer to the appropriate power supply section for voltage-fuse selection.

It is important to note all systems are shipped for 110-120VAC. The accessory pack is equipped with the fuse for European installations.

Voltage Selection.

1. Unplug the AC power cord from the back of the system. Turn the chassis so the back faces you.
2. Slide the fuse cover up to expose the fuse and voltage selector board, shown in Figure 2-4.

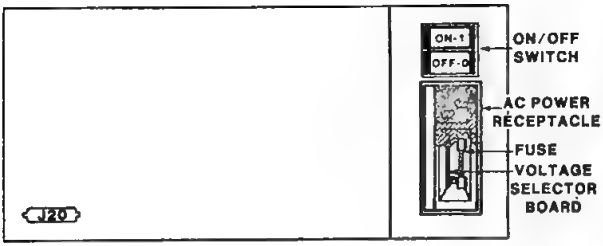


Figure 2-4. System 310 Chassis Back Panel

3. Raise the FUSE PULL lever so it is out of the way of the voltage selector board. The bottom of the fuse is ejected from the fuse holder when the FUSE PULL lever is raised. Use needle-nosed pliers to hold the board in the middle where there are no exposed contacts. Wiggle the board up and down until it loosens, then pull it straight out.
4. Select the correct voltage setting and fuse from the appropriate power supply section in this book. Replace the board such that the correct voltage faces you when installed. Push the board firmly into place until the FUSE PULLer lever is free to drop down.

Fuse Replacement.

1. Grasp the bottom of the fuse with your fingers and pull all the way out.
2. Pull the FUSE PULL lever down and replace the fuse. It does not matter which direction the fuse is inserted.

Attaching a Terminal to Your System 310. To attach the terminal to your system, connect a standard RS-232 cable between connector J20 on the System 310 back panel (Figure 2-4) and the connector located on the back of the terminal. Be sure the baud rate of the terminal is set to 9600, parity-none and one start/stop bit. Refer to the following table for the list of compatible terminals.

ADDR Info
ADDS Consul 980
ADDS Regent and Viewpoint
Ampex Dialogue 80
Ann Arbor
Beehive (Intel/Siemens)
Carlock
CDC 456
Cobar 3132 (VT52 mode)
Cobra (86/735 terminal)
Compucolor II
Concept C100, C108
Cybernex XL-83
Data General 6053
Datamedia 2500, 3025, 5000
Delta Data 5000
DEC VT100 (VT52 mode)
DEC VT50 & VT52
Exidy Smart
General Terminal 100A
Hazeltine 1500,1510,1520
Heathkit H19
Hewlett-Packard 2626
IBM Personal Computer
Liberty Electronics Freedom 100
LSI adm3
Microterm Act IV, Mime 1
Omron 8025AG
Perdin Elmer 550, 1100, 1200
Sol
Soroc 120
Teleray 1061, 3800
Terak (Datamedia 1520 emulation)
Televideo 912
Volker-Craig 404
Visual 200
Wyse 50, 75
Zentec 30
Zentec Ubell Char

2.2 Backplane

Specifications

Interface: MULTIBUS, IEEE 796

Functional Description

The System 310 backplane provides MULTIBUS interconnections, bus request priority arbitration, electrical interface to the front panel and distributes power to the MULTIBUS circuit boards and the fans.

Seven MULTIBUS slots are provided. Slot priority is factory set to match the slot number. Slot one, bottom, has a priority of one and slot seven priority of seven, seven being the highest priority. Priority of each slot can be changed through jumper selection. Priority signals BPRN1 to 7 are jumpered to board slot BREQ1 to 7 inputs.

The front panel interupt button is factory set for INT 1 and is jumper selectable on the backplane.

The iLBX P2 connectors on 286 based systems provide three iLBX compatible slots J1, J2 and J3 (86-based systems contain a P2 connector, non-LBX). The iLBX bus may be extended two additional slots (maximum) using a jumper cable assembly (173842-001).

CAUTION

Use only iLBX compatible circuit boards in backplane slots served by the iLBX bus. Otherwise, system operation will be disrupted and components could be damaged. Factory standard systems are keyed so incompatible circuit boards cannot be inserted in iLBX positions.

Also, do not plug iLBX compatible circuit boards into non-iLBX slots; these slots may carry signals that conflict with the iLBX boards' P2 connector signals.

Removal

1. Turn the power switch off and disconnect the AC power cord from the back of the system.
2. Remove the top cover, backpanel, and all circuit boards from the cardcage.
3. As shown in Figure 2-5, there are five screws holding the cardcage in place: four outside and one inside near slot 1 (bottom). Loosen or remove these screws as instructed in the figure.
4. Disconnect the cables and +5 VDC leads from the backplane. Mark the cables or make a diagram showing where they go.
5. Lift the cardcage out.
6. Remove the screw holding the auxilliary connector to the backplane (five screws for P2 backplane) then remove the four screws holding the backplane to the cardcage.

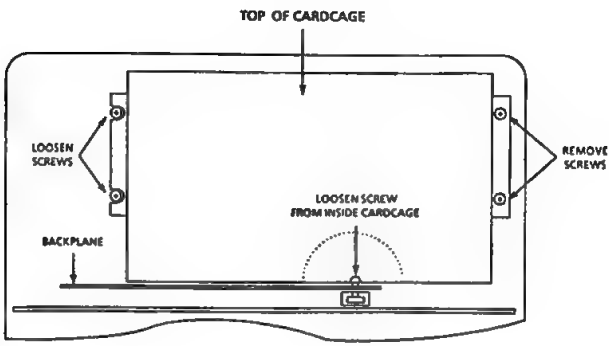


Figure 2-5. Cardcage Removal

Installation

Hardware installation process is the same as removal except in reverse order.

All standard versions of the System 310 requires jumper installation at the following locations.

E2-E10	E33-E34
E19-E20	E35-E36
E21-E22	E37-E38
E23-E24	E39-E40
E25-E26	E41-E42
E27-E28	E43-E44
E29-E30	E45-E46
E31-E32	

Use the following jumpering for the P2 backplane in all standard versions of the System 310:

E1-E5	E11-E15
E2-E6	E12-E16
E3-E7	E17-E21
E4-E8	E18-E22
E9-E13	E19-E23
E10-E14	E20-E24

2.3 Power Supplies

220 Watt Power Supply

Electrical Characteristics

DC Specifications

+5 VDC ± 5% @ 30.0 amps
+12 VDC ± 5% @ 4.7 amps
−12 VDC ± 5% @ 4.7 amps

Maximum DC output power cannot exceed 220 watts.

AC Specifications

90 to 132 VAC, 4.6 amps max
198 to 264 VAC, 2.3 amps max.
47 to 63 Hz

Maximum AC power consumption is 523 watts.

Fuse Ratings
90 to 132 VAC, 6 amp, normal blo
198 to 264 VAC, 3 amp, normal blo

Functional Description

The power supply provides power for system cooling fans, backplane, circuit boards, floppy and hard disks.

270 Watt Power Supply

Electrical Characteristics

DC Specifications

+5 VDC ± 5%, 45.0 amps
+12 VDC ± 5%, 4.7 amps
−12 VDC ± 5%, 4.7 amps

Maximum DC total output power is 270 watts.

AC Specifications

88 to 132 VAC, 4.6 amps
198 to 264 VAC, 2.3 amps
47 to 63 Hz

Maximum AC power consumption is 523 watts.

Fuse Ratings
88 to 132 VAC, 8 amp, normal blo
198 to 264 VAC, 4 amp, normal blo

Functional Description

The power supply provides power for system cooling fans, backplane, circuit boards, floppy and hard disks.

360 Watt Power Supply

Electrical Characteristics

DC Specifications

+5 VDC ± 5%, 45.0 amps
+12 VDC ± 5%, 8.0 amps
-12 VDC ± 5%, 2.5 amps

Maximum DC total output power is 360 watts.

AC Specifications

88 to 132 VAC, 4.6 amps
198 to 264 VAC, 2.3 amps
47 to 63 Hz

Maximum AC power consumption is 523 watts.

Fuse Ratings
88 to 132 VAC, 10 amp, normal blo
198 to 264 VAC, 6 amp, normal blo

Functional Description

The power supply provides power for system cooling fans, backplane, circuit boards, floppy and hard disks.

3.1 iSBC 86/30 CPU *

Specifications

Electrical Characteristics

+5 VDC ± 5%, 4.9 amps
+12 VDC ± 5%, .1 amps
−12 VDC ± 5%, .1 amps
add .3 amps @ +5 VDC for each 8k EPROM

Clock Speed

5.0 Mhz

Memory

RAM	128k bytes dynamic (expandable to 1M bytes) 00000-1FFFFH (as-shipped) 750 ns cycle time
EPROM	0 to 64k bytes (32k as-shipped) F0000-FFFFFH (F8000-FFFFFH as-shipped) 500 to 875 ns (jumper selectable)

Interface

MULTIBUS, IEEE-796
RS-232C serial
parallel, centronics compatible
two (2) iSBX Bus connectors

Functional Description

The iSBC 86/30 operates as the System 310 MULTIBUS master processor board. It contains the 16 bit 8086 microprocessor,

*All CPUs are used in card slot #1, the bottom slot.

32k of ROM, 128k of RAM, PIT, PIC, USART and PPI configured as a non-standard Centronix printer interface. Two iSBX connectors (J3 and J4) provide I/O expansion capability. Refer to Figure 3-1 for component layout.

The 8086 microprocessor, with a selectable clock rate, manages system memory, I/O, two timers and expansion systems. The 86/30 board can accept the iSBC 304 RAM expansion, iSBC 337 Math Coprocessor, iSBX 218 Flexible Diskette Controller or iSBC 309 Memory Management board in various 310 configurations. See Chapter 1, "Configuration Guide."

Installation

The 86/30 processor board is to be installed in backplane card slot number 1. MULTIBUS and iSBX expansion configurations for the 86/30 are shown in Table 3-1. The as-shipped processor board jumper list is contained in Table 3-2.

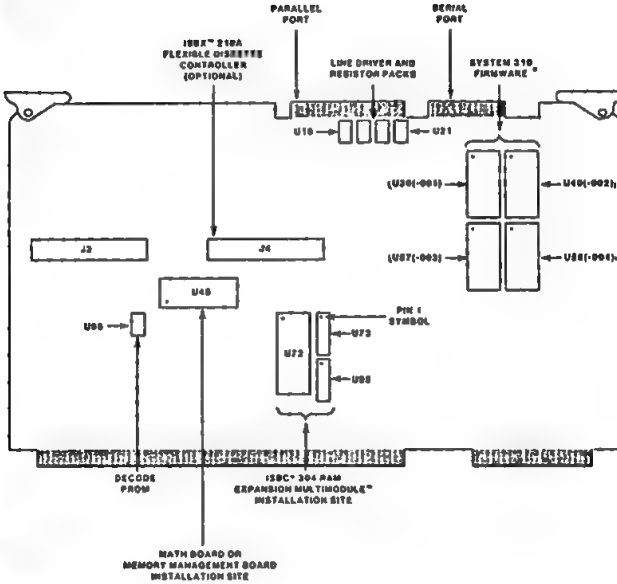


Figure 3-1. Location of Added Components

Table 3-1. Valid Memory Board Combinations

Total Size (System)	Board Name and Size in Bytes	Address Range in Hex
Combination 1 128K Bytes (310-1)	86/30 processor, 128K	00000–1FFFF
Combination 2 256K Bytes (310-2)	86/30 processor, 128K 304 MULTIMODULE, 128K	00000–1FFFF 20000–3FFFF
Combination 3 384K Bytes	86/30 processor, 128K 056A memory, 256K	00000–1FFFF 20000–5FFFF
Combination 4 512K Bytes	86/30 processor, 128K 304 MULTIMODULE, 128K 056A memory, 256K	00000–1FFFF 20000–3FFFF 40000–7FFFF
Combination 5 640K Bytes (310-3)	86/30 processor, 128K 012B memory, 512K	00000–1FFFF 20000–9FFFF
Combination 6 768K Bytes	86/30 processor, 128K 304 MULTIMODULE, 128K 012B memory, 512K	00000–1FFFF 20000–3FFFF 40000–BFFFF
Combination 7 896K Bytes	86/30 processor, 128K 056A memory, 256K 012B memory, 512K	00000–1FFFF 20000–5FFFF 60000–DFFFF
Combination 8 960K Bytes w/out 544	86/30 processor, 128K 304 MULTIMODULE, 128K 056A memory, 256K 012B memory, 448K	00000–1FFFF 20000–3FFFF 40000–7FFFF 80000–EFFFF

Jumpers must be installed between the following pins on 86/30 boards in *all* standard System 310 configurations. Refer to Table 3-2.

Table 3-2 iSBC® 86/30 Jumper List

2 to 3	84 to 85	149 to 164
5 to 9	88 to 89	151 to 152
13 to 14	90 to 91	175 to 176
15 to 16	92 to 93	178 to 179
17 to 18	94 to 95	184 to 185
22 to 23	96 to 97	189 to 193
26 to 32	96 to 102	190 to 194
28 to 32	112 to 113	191 to 195
30 to 31	114 to 115	202 to 203
33 to 34	118 to 119	205 to 207
36 to 37	123 to 124	208 to 209
38 to 39	127 to 154	213 to 214
40 to 41	128 to 155	232 to 233
42 to 43	130 to 134	254 to 255
45 to 54	131 to 142	258 to 259
46 to 55	132 to 157	261 to 262
47 to 56	136 to 159	263 to 264
48 to 57	138 to 139	266 to 268
49 to 58	139 to 145	267 to 269
50 to 59	140 to 153	270 to 272
52 to 61	142 to 144	275 to 276
60 to 63	144 to 145	277 to 278
76 to 77	147 to 158	

The presence or absence of MULTIMODULE boards on the 86/30 board determines the settings of additional jumpers, as follows:

1. If there is an iSBX 218A mounted on the 86/30 board, install a jumper between pins 152 and 169; remove the jumper between pins 151 and 152.
2. If there is an iSBX 304 mounted on the 86/30 board, install jumpers between pins 118 and 119, and 119 and 120. Remove the jumper between pins 232 and 233.

NOTE

Those 86/30 boards that have an iSBC 304 installed require a different address decoding PROM (U66) than those without the iSBC 304.

3. If there is an iSBC 337 mounted on the 86/30 board, install a jumper between pins 165 and 166.

CPU iSBC 86/30, Feature F10, 172842-004

	PRODUCT HISTORY
143799-025	Remove jumpers which serve no function or purpose.
172842-004	U66—Address decoding PROM 144108-001 w/ 304 installed 144109-001 w/o 304 installed

3.2 iSBC 86/35 CPU *

Specifications

Electrical Characteristics

+5 VDC ± 5%, 3.9 amps
+12 VDC ± 5%, .016 amps
−12 VDC ± 5%, .006 amps

Clock speed

5.0 or 8.0 Mhz (jumper selectable, 8 Mhz default)

Memory

RAM	512k bytes dynamic (expandable to 1M byte) 00000-7FFFFH (as shipped) 750 ns cycle time (8.0 Mhz)
EPROM	0 to 256k bytes (32k bytes as-shipped) C0000-FFFFFH (F8000-FFFFFH as-shipped) 500 to 875 ns (jumper selectable)

Interface

MULTIBUS, IEEE-796
RS-232C serial
Centronics compatible parallel
Two (2) iSBX Bus connectors

Functional Description

The 86/35 CPU board operates as the System 310 MULTIBUS master processor board. Refer to Figure 3-2 for component layout.

The 86/35 CPU board features the 8086 microprocessor, 512k bytes RAM (expandable to 1M byte on board), 28 pin sockets

***All CPUs are used in card slot #1, the bottom slot.**

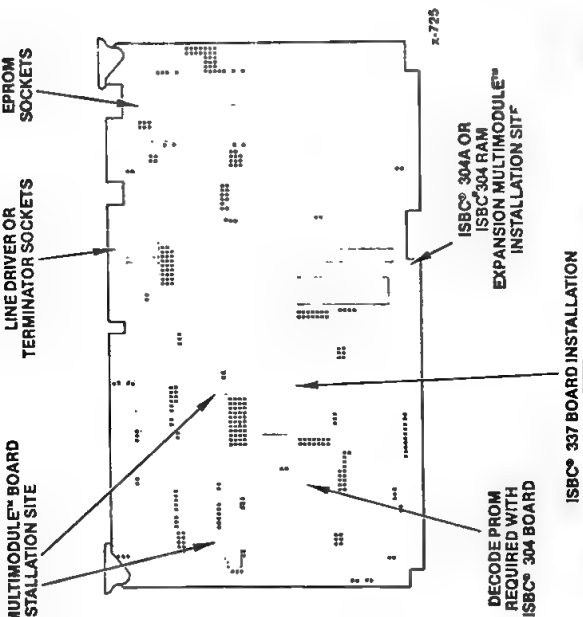


Figure 3-2. iSBC 86/35 Component Layout

for EPROM expansion up to 256k bytes, two iSBX bus connectors, +5 VDC only power source** (except when using RS232C interface or some MULTIMODULE boards), RS232C serial channel, two programmable timers and 20 bit addressing with bank-select for possible 16M bytes of memory**. Refer to Chapter 1, "Configuration Guide."

Installation

The 86/35 CPU board is to be installed in the backplane card slot number 1 (bottom slot). MULTIBUS and iSBX expansion installations are the same as that for the 86/30. The jumper selections are in Table 3-3.

Table 3-3. iSBC 86/35 Jumper List

2-3	49-58	132-157	205-207
5-9	50-59	134-157	208-209
13-14	52-61	136-159	213-214
15-16	60-63	144-145	238-239
17-18	76-77	147-158	254-255
22-23	84-85	149-164	258-259
26-32	88-89	151-152	261-262
28-32	90-91	153-155	265-266
30-31	92-93	165-166	267-269
33-34	94-95	175-176	270-272
35-39	96-97	178-179	275-276
42-43	96-102	184-185	277-278
45-54	98-99	189-193	283-284
46-55	98-104	190-194	286-287
47-56	112-113	191-195	292-293
48-57	114-115	202-203	294-295

When adding an iSBC304 install 232-233, 119-120 & 238-239. When adding an iSBC314 install 119-120, 230-231, 238-239 & 242-243.

To install an 86/35 from factory default remove 7-11, 26-27, 44-53, 51-60 & 210-211.

**Not used in standard System 310 configurations.

CPU 86/35, 146070, PBA 146071

	PRODUCT HISTORY
-002	Production Release. PBA -002.
-003	ES version of board. Added faster DRAMs to allow 1-waitstate operation. Replaced 8253-5 with 8254-2 due to availability. Added three stake pins (E289, E290 and E291) for 1-waitstate operation. PBA -005.
-004	Add new address decode PROM U66, 149061. Remove label and add new SIP sockets. PBA -006.

3.3 ISBC 286/10 CPU *

Specifications

Electrical Characteristics

+5 VDC ±5%, 7.6 amps
+12 VDC ±5%, .1 amps
−12 VDC ±5%, .1 amps

Clock Speed

6.0 Mhz

RAM or ROM Memory

128k bytes Dual port max.
256k bytes local max.

Interface

MULTIBUS, IEEE-796
Two RS-232C serial
parallel, centronics compatible
two (2) iSBX Bus connectors

Functional Description

The iSBC 286/10 operates as the System 310 MULTIBUS master processor board. It contains the 24 bit 80286 microprocessor configured with two RS-232C serial ports and a Centronix printer interface. Two iSBX connectors provide I/O expansion capability.

The 80286 microprocessor manages up to 8 Mbytes of system memory or 16 Mbytes of iLBX memory, I/O, two timers and expansion systems. The 286/10 board can accept the 1 Mbyte iSBC 341 RAM expansion module while allowing four additional memory devices and the 80287 Math Coprocessor in various 310 configurations. See Chapter 1, "Configuration Guide."

***All CPUs are used in card slot #1, the bottom slot.**

Installation

The 286/10 processor board is to be installed in backplane card slot number 1. The as-shipped jumper list is used and provided in Table 3-4. Refer to Figure 3-3 for board layout.

Table 3-4. iSBC 286/10 CPU Jumper Configuration

5-6	85-87	155-156	216-217
8-9	90-91	157-158	218-219
12-13	92-106	159-160	222-223
15-16	94-131	168-169	224-225
27-32	95-101	173-174	226-227
28-33	98-100	183-184	231-232
29-34	104-120	190-191	236-237
30-35	108-144	192-193	246-247
31-36	110-125	194-203	249-250
40-41	116-130	195-204	251-252
43-44	121-135	196-205	253-254
49-57	122-147	197-206	255-256
62-63	126-141	199-208	261-262
66-88	133-139	200-209	267-268
70-72	143-114	201-210	269-270
71-73	149-150	202-211	271-272
75-76	152-153	212-213	273-274
77-78			

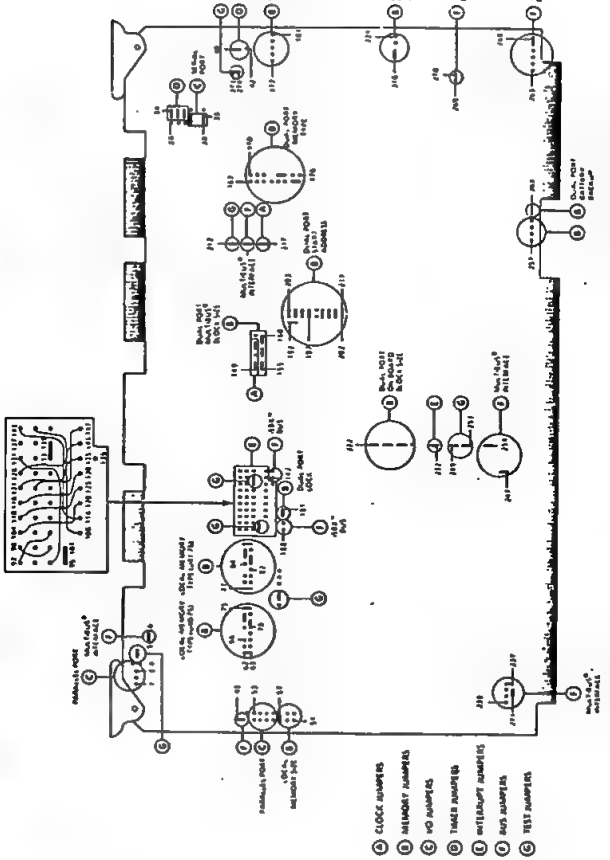


Figure 3-3. iSBC 286/10 CPU Jumper Configuration.

iSBC 286/10 CPU, 145691, PBA 146251

	PRODUCT HISTORY
-007	Production Release. PBA -002.
-008	Add socket strip with jumper between pins 24 & 30 of NDP (U25). Prevents NDP failure when running iRMX 286R.
-009, -010	Drops "S" designation because B-2 stepping of 80286 is installed. Add R32 and R33 pull up resistors for 82288. PBA -005.
-011	Changes for 82289 emulator board. PBA -006.

3.4 iSBC 286/12 CPU *

Specifications

Electrical Characteristics

+5 VDC ±5%, 9.75 amps
+12 VDC ±5%, .1 amps
−12 VDC ±5%, .1 amps

Clock Speed

8.0 Mhz

Memory

128k bytes ROM max.
1M byte on board Dual Port RAM (iSBC341)

Interface

MULTIBUS, IEEE-796
Two RS-232C serial
A: RS-232C DCE or DTE or
RS-422A/449 DCE (req. component change)
B: RS-232C DCE only
parallel, centronics compatible
two (2) iSBX Bus connectors

Functional Description

The iSBC 286/12 operates as the System 310 MULTIBUS master processor board. It contains the 24 bit 80286 microprocessor configured with 1M byte Dual Port RAM (iSBC341), two RS-232C serial ports and a Centronix printer interface. CPU default configuration has P2 as a high-speed synchronous interface for EX Series Memory boards. Two iSBX connectors provide I/O expansion capability.

***All CPUs are used in card slot #1, the bottom slot.**

Installation

The 286/12 processor board is to be installed in backplane card slot number 1. Refer to Figure 3-4 for jumper locations. Table 3-5 contains the CPU board jumper list. Note: Systems in an OpenNet NRM configuration remove E84-E104 and install E66-E84.

Table 3-5. iSBC 286/12 Board Default Configuration Jumpers

E5-E6	E80-E100	E116-E117	E187-E189
E9-E15	E81-E101	E127	E188-E190
E11-E17	E84-E104	E132	E196-E208
E12-E18	E85-E105	~~E133-E135~~	E197-E210
E19-E20	E86-E106	E136-E137	E205-E218
E24-E25	E87-E107	E146-E147	E206-E219
E28-E29	E88-E108	E152-E153	E207-E220
E32-E33	E89-E109	E156-E158	E211-E224
E36-E37	E90-E110	E159-E160	E212-E225
E40-E41	E91-E111	E161-E162	E213-E226
E44-E45	E92-E112	E167-E168	E214-E215
E48-E49	E93-E113	E171-E172	E227-E228
E52-E53	E94-E114	E173-E174	E243-E244
E56-E57	E95-E115	E175-E176	E245-E246
E63-E64	E98-E118	E179-E180	E247-E248
E77-E97	E102-E122	~~E181-E182~~	E142-E143
E79-E99	E103-E123	~~E185-E186~~	

EWP538
7-28-86

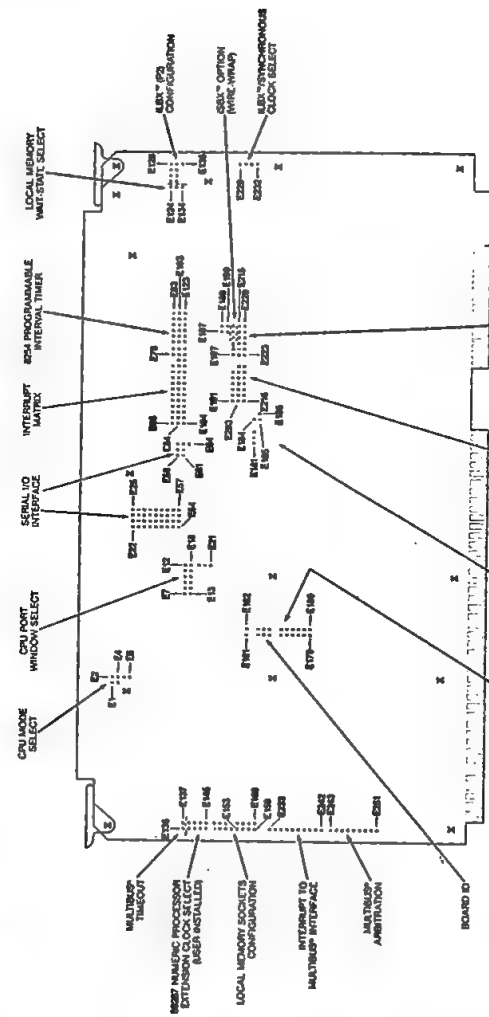


Figure 3-4. iSBC 286/12 Board Jumper Location Diagram

CPU iSBC 286/12, Feature F149, 147522

	PRODUCT HISTORY
-002	Software inhibit signal did not properly mask signal (CPURST) during a software reset. This could cause another master to time out on a slave access, or could require reinitialization of the 8255A and 8274 after a soft reset Replaced PAL V58; was 147877 is 148270 Replaced PAL U50; was 147994 is 148271 Replaced PAL U51; was 147871 is 148229
-003	Default jumpering changed from asynchronous iLBX to synchronous iLBX.
-004	Fix soft reset errors for STBL.

4.1 iSBC 304 RAM Memory Module

Specifications

Electrical Characteristics

+5VDC @ 1.4 amps

Cycle Time

800 ns (one added wait state, word read/write)
1100 ns (three to five added wait states, byte write)

Memory

128k bytes dynamic RAM

Functional Description

The iSBC 304 Memory MULTIMODULE provides 128k bytes of RAM to the CPU board.

Installation

The following steps explain how to unpack and install the iSBC 304 board.

1. Unpack the iSBC 304 board.
2. Inspect the iSBC 304 board for damage.
3. Remove the CPU board from the backplane and place it (component side up) on a soft surface (preferably antistatic foam).
4. Remove IC 8203 at U72 from the CPU board.
5. Remove ICs (74S373) at U73 and U95 from the CPU board.

NOTE

Save these ICs. They will be reinstalled in a later step.

6. Insert the iSBC 304 board mating pins into socket U72 and other mating pins, orienting the board as shown in Figure 4-1.
7. Ensure the mating pins are aligned, carefully press the iSBC 304 board into place by applying pressure at U1 of the iSBC 304 board.
8. Place a nylon spacer between the CPU board and the iSBC 304 board at one ofthe holes.
9. Insert a screw from the solder side through the CPU board, the spacer and the iSBC 304 board.
10. Attach the nut and tighten finger tight.
11. Repeat steps 8 through 10 for the other two holes.
12. Tighten all three screws, using a screw driver.

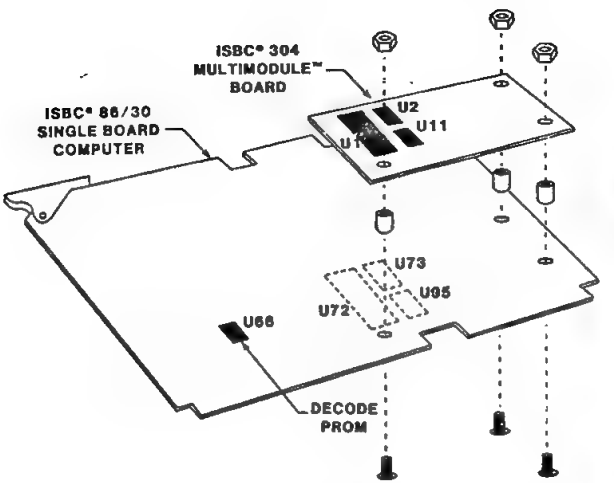


Figure 4-1. Installing the 304 RAM Board

CAUTION

Do not overtighten the screws. Damage to the board could result.

13. Insert the 8203 IC (removed in step 4) into location U1 on the iSBC 304 board (should be directly above chip location U72 on the CPU board).
14. Insert the two 74S373 ICs (removed in step 5) into locations U2 and U11 on the iSBC 304 board.

CAUTION

Ensure the ICs are properly oriented in their sockets or they could be damaged when power is applied.

15. Remove the decoder IC from CPU board location U66 (86/30) or U49 (86/35).
16. Insert the new IC supplied with the iSBC 304.
17. Install jumper E119-E120 onto the CPU board.
18. Remove jumper E232-E233 from the CPU board.

iSBC 304 128k byte RAM Expansion

	PRODUCT HISTORY
	PWA 143561
-003	Production Release
-004	Change RAM chips from cerdip to plastic.
	PBA 146172
-003	Use new PB which is common to iSBC 300, 300A and 314 for cost reduction.
-006	Replace 200ns DRAMs with 150ns DRAMs to guarantee reliable data at 1 wait state operation.

4.2 iSBC 309 Memory Management Module

Specifications

Electrical Characteristics

+5VDC ± 5% @ 2.0 amps max.

Clock Speed

5.0 or 8.0 Mhz

Functional Description

The iSBC 309 Memory Management Module controls partitions for XENIX* with mapping and memory protection in 2k byte boundarys. The iSBC 309 board prevents use of one iSBX MULTIMODULE connector.

Installation

The following steps outline iSBC 309 installation.

1. Ensure all power is off then remove the CPU board from the system.
2. Remove the leftmost iSBX MULTIMODULE board, if present.
3. Carefully remove the 8086 processor device from the CPU board.
4. Install the 8086 processor device into the iSBC 309 board socket U36. Ensure the notched end of the 8086 faces resistors R1-R4. If the 8087 Numeric Data Processor device is used, install it in the iSBC 309 board socket U37 (leftmost socket).

*XENIX is a registered trademark of Microsoft Corporation.

5. Remove the plastic protective case from the iSBC 309 board connector P1. Inspect all pins for damage. Align or clean all questionable pins.
6. Using two of the spacers and screws provided, install them into the solder side of the iSBC 309 board, refer to Figure 4-2.
7. Carefully insert the iSBC 309 connector P1 into the microprocessor socket. Ensure all pins are properly seated. Press down on the iSBC 309 board until the spacers are flush to the CPU board surface.
8. Secure the spacers to the CPU board by installing two screws from the solder side of the host CPU board.

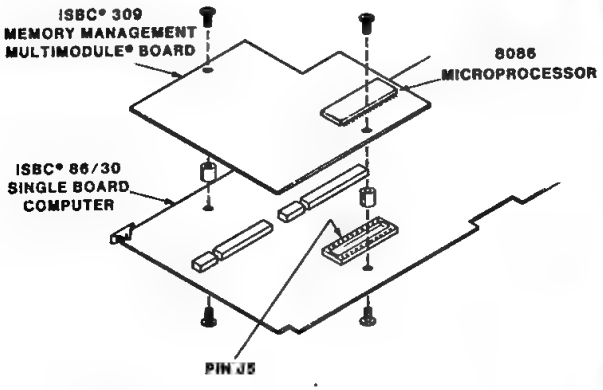


Figure 4-2. Hardware Mounting Technique

iSBC 309 Memory Management Module

	PRODUCT HISTORY

4.3 iSBC 337/A Numeric Data Processor

Specifications

Electrical Characteristics

+5VDC ± 5% @ .475 amps

Clock speed

5 Mhz (8087-3) (default)
8 Mhz (8087-2) (337A default)
10 Mhz (8087-1)

Functional Description

The iSBC 337 NDP MULTIMODULE provides a floating-point math execution vehicle for the CPU board. Operating at 5 Mhz in 310 Systems, processing occurs during interupt cycles transmitted through P2-2.

Installation

1. Remove the CPU board.
2. Remove the 8086 microprocessor from the CPU board.
3. Insert the NDP board mating pins into the CPU's IC socket, also, P2 into J5 of the base processor board and press firmly.
4. Insert the 8086 processor into the iSBC NDP board (be sure to locate pin 1 properly).
5. Install jumper E165-E166 on the CPU board. (Installation of iSBC 337 jumper E1 and E2 is for iSBC 86/12 or 86/12A CPU boards only.)
6. Reinsert the CPU board into the 310 System.

iSBC 337/A Numeric Data Processor

	PRODUCT HISTORY
172839-001 172839-002	Add new PBA (no. 146141) for manufacturability.

5.1 iSBC 213 Data Separator

Specifications

Electrical Characteristics

+5VDC ± 5% @ 1.4 amps

Functional Description

The iSBC 213A Data Separator board separates the serial data stream from the Winchester drive into separate data and clock signals. One Data Separator board can function for two Winchester drives.

Removal

1. Turn the power switch off, disconnect the power cord, and remove the top cover.
2. Refering to Figure 5-1, carefully remove the nylon nuts and screws holding the top of the data separator circuit board to the center mounting panel.
3. Pull the board out far enough to gain access to the data and power connectors and disconnect them, noting the connector placement.
4. Pull the data separator up and out.

Installation

Installation is the same as removal except in reverse order.

Cabling connections:

J1 Controller board data
J2 Wini #2 data
J3 Wini #3 data

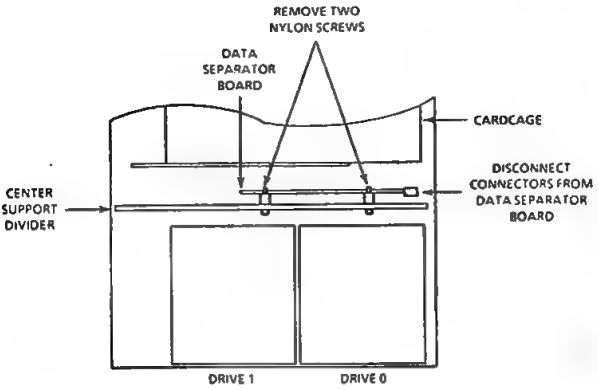


Figure 5-1. Data Separator Removal

iSBC 213 Data Separator, 132727

	PRODUCT HISTORY
132722-003	Production Release.
-004	New qualification test on VCO part.

5.2 iSBC 214 Winchester Disk Controller

Specifications

Electrical Characteristics

+5 VDC ±5% @ 4.5 amps

Memory

32k bytes ROM
32k bytes RAM

Interface

MULTIBUS: IEEE 796
Winchester: ST506/ST412
Floppy: SA460/450
Tape: QIC-2

Data Transfer

MULTIBUS: 1.6M bytes/sec
Winchester: .63M bytes/sec
Floppy: 31.25K bytes/sec
Tape: 30K bytes/sec

Functional Description

The iSBC 214 Peripheral Controller subsystem provides control for two 5¼-inch Winchesters, flexible disk drives and ¼-inch streaming tape drives in a single board package. The iSBC 214 supports the MULTIBUS and DMA interface. It provides a full three track buffering, onboard ECC, automatic error recovery and retry, automatic defective track handling and transparent data error corrections.

Removal and Installation

The iSBC 214 Peripheral Controller board is to be installed in card slot number 7. Refer to Figure 5-2 for component and jumper

locations. The Controller is used in its default jumper configuration. See Table 5-1 for the jumper list.

Cabling schemes are listed below.

Connector	Device
J1	Wini Control
J2a, b	Wini data
J3	Tape formatter
J4	Floppy

Table 5-1 iSBC 214 Jumper List

E2-E3	E37-E39	E91-E92	E117-E118
E4-E5	E57-E58	E93-E94	E119-E120
E11-E12	E75-E76	E97-E98	E121-E122
E15-E16	E77-E78	E101-E102	E126-E129
E17-E18	E79-E81	E103-E104	E135-E138
E20-E21	E82-E83	E105-E106	E137-E140
E22-E23	E84-E85	E111-E112	E142-E143
E31-E33	E86-E87	E113-E114	E144-E145
E36-E37	E89-E90	E115-E116	

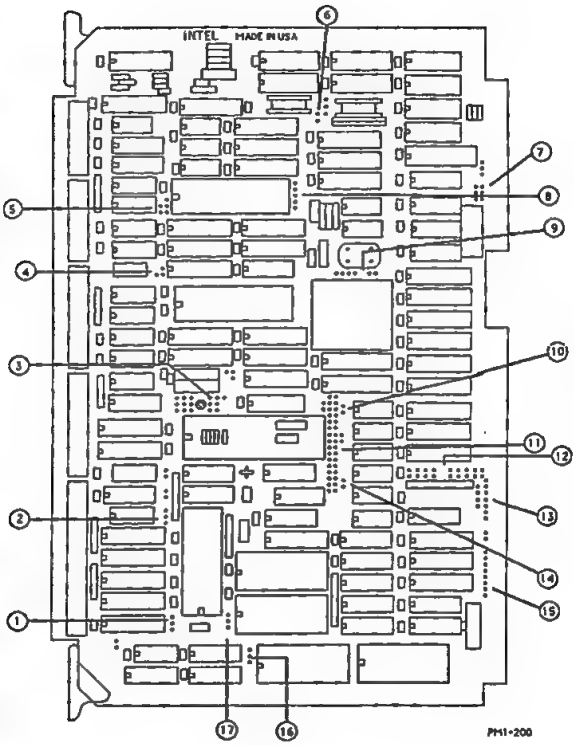


Figure 5-2. iSBC® 214 Controller Board Jumper Locations

iSBC 214 Peripheral Controller, 135837

	PRODUCT HISTORY
-003	Change printed board due to small hole and pad sizes of connectors J1, J2A, J2B, J3 and J4.
-004	Firmware update to fix: recalibration, step rate, seek errors, track buffering with multiple drives, incorrect status, defective track formatting, floppy power-on initialization, tape reset timeout and full tape streaming. Update also adds: allow additional floppy formats, turn floppy motor on at power-up (mode 3 only), wini is deselected on hard errors, wini write precomp can be disabled, additional command functions available to Operating System. Default jumper changed for BUS TIMEOUT to be disabled (E11-E12). PROM U45 was 135164-004 is -005, PROM U64 was 135165-004 is -005.

5.3 iSBC 215G Winchester Disk Controller

Specifications

Electrical Characteristics

+5 VDC ± 5% @ 4.52 amps
−5 VDC ± 5% @ 15 milliamps (8″ drive only)

Data Transfer

5M bits/sec

Functional Description

The iSBC 215 Generic Winchester Disk Controller board allows as many as four 5¼ or 8 inch Winchester drives to be connected to the System 310. The iSBC 215G supports the MULTIBUS and DMA interface. It provides full sector buffering, onboard ECC, automatic error recovery and retry, automatic defective track handling and transparent data error corrections. The iSBC 215G board is also equipped with two iSBX connectors which allow it to serve as host for two MULTIMODULE expansion boards. iSBC 215G boot capabilities are produced via CPU board firmware.

Removal and Installation

1. Turn the power switch off and disconnect the AC power cord from the back of the chassis.
2. Remove the back panel screws and lift panel.
3. Disconect any cables attached to the iSBC 215G (and the 218A if attached) denoting location and position.
4. Remove the iSBC 215G by pulling on the ejector levers.

Installation is the same as removal except in reverse order.

The jumper configuration is as follows:

W1-1 to W1-3
W3-1 to W3-2
W4-1 to W4-2*
W5-1 to W5-3
W6-1 to W6-3
W7-1 to W7-3
W8-1 to W8-3
W9-1 to W9-2
W10-1 to W10-2
W11-1 to W11-3
W13-1 to W13-2
W14-1 to W14-2
W16-1 to W16-2
W17-1 to W17-2
W18-1 to W18-2*
W19-C to W19-5
W20-1 to W20-2
W21-1 to W21-3
W23-1 to W23-2
W25-1 to W25-2
W27-1 to W27-2
W29-8 to W29-9
W30-1 to W30-20
W30-2 to W30-19
W31-1 to W31-2
W33-1 to W33-2
W37-1 to W37-2
W38-1 to W38-2
W22-1 to W22-2

*iSBC 215G boards with an iSBX 218A board mounted on it requires W4-1 to W4-2 removed and W24-1 to W24-2 installed.

iSBC 215G Winchester Disk Controller, 172835, PBA 173768

	PRODUCT HISTORY
-006	Glitch on Advanced Memory Write—cut and jumper. PBA 144263-010
-007	New PBA (144263-012) to eliminate the glitch and correct firmware bugs. **Firmware** P/N 173114 OMO Version 2.0, 5/9/83 1. Fixes state changes in drives 2, 3, 4 error during channel one run time. 2. Drive Fault error when sector not found or drive not ready. 3. Fix bug in 24 bit addressing. 4. Fix to reject illegal device codes of 02H, 06H, 07H. 5. Illegal Command error on status word (byte 0 & 1) from 0800H to 0801H. 6. Fix 8089 "reset hickup" when ch1 & ch2 attention collide. Note: The iSBC 215G board requires one cut and three jumpers. Firmware is downward compatible without the cut and jumper modification to the board but both 5/9 firmware plus board modification are required to fix item #6. 7. Fix QIC2 tape hang problem when a "write command in progress" is started but a "read command" is given next instead of another "write command" or vice-versa.

	PRODUCT HISTORY
	P/N 173397 OMO Version 2.0, 5/30/83 1. Allows any combination of hard or floppy drives 0–3 to be attached or unattached. 2. Decreases floppy drive Head Load Time default from 152 to 76 msec. P/N 146136 OMO Version 2.1, 6/22/83 1. Fixes 5/9/83 item one problem—visible for multiple floppy drives only. 2. Fixes bad status on Priam hard disk drives. 3. Fixes "seek error" for retries on hard disc drives. 4. Fixes "read" retry recovery for hard disc drives. P/N 173691 OMO Version 2.2 8/30/83 1. Fixes read/write hang (8089). 2. Fixes hard disc alternate track switching problem. 3. Fixes tape OIC2 end of tape status from "soft error" to "hard error".

	PRODUCT HISTORY
	P/N 146276 OMO Version 2.3, 10/7/83 1. Fix tape QIC2 actual count errors at end of tape. 2. Fix status to report "write protect" only for write-erase commands. 3. Change floppy motor on time from 13 to 2 seconds. 4. Stop non-peripheral commands from setting interupt modifier bits in unit status registers used in channel 2. 5. Seperate seek timeout timers on multiple drive systems. 6. Remove software reset from floppy initialization for different data density devices on multiple device systems. P/N 146979 ISO-S Version 2.4 6/5/84 1. Increase spin-up delay from 330 msec to 800 msec.* 2. Removes spin-up from drive ready signal.* 3. Fixes unfinished seeks and recalls with ready change.* 4. Change incorrect floppy media change status from x8H to xCH. 5. Change default floppy stepping rate.time and head loading time from 32 msec and 76 msec to 22 msec and 36 msec. 6. Fixes 24 bit addressing boundry crossing for hard discs and floppy.

	PRODUCT HISTORY
	P/N 174581 ISO-N Version 1.2 9/13/84 1. Increases tape timeout from 5 sec to 3 minutes. 2. Fixes 24 bit addressing boundry crossing for tape. 3. Change tape status polling from every 4 msec to twice a second. 4. Add hard disc ready 300 msec filter for drives with ready glitch. 5. Increase implied seek timeout for hard discs from 747 msec to 10 sec. 6. Add instruction to eliminate hang from subsequent tape commands after tape timeout error. 7. Fixes trash hard disc problem when tape timeout errors occur. P/N 147931 ISO-S Version 2.5 3/7/85 1. Incorporate all changes in ISO-N Version 1.2 174581. 2. Fix floppy read-id command. *For Teac half height drive related problems.

5.4 iSBX 217C Magnetic Cartridge Tape Interface

Specifications

Electrical Characteristics

+5V VDC ±5% @ 1.5 amps

Interface

QIC-02 (default) or
HCD-75 (3M Company)

Functional Description

The iSBX 217C board interfaces with the CPU board or iSBC 215G board through an iSBX Bus connector. Its function is to interface industry-standard ¼-inch magnetic cartridge tape drives to a host MULTIBUS processor board. Each iSBX 217C board can support up to four tape drives (of the same manufacturer).

Installation and Removal

1. Remove the iSBX 217C board's host board (either the processor board or the iSBC 215G board) from the cardcage.
2. Remove the iSBX 217C mounting screws.
3. Remove the iSBX 217C board.

Use a reverse procedure for installation.

If the 217C board is mounted on the iSBC 215G board, install the following jumpers:

E8-E29	E33-E48	E46-E61	E77-E78
E10-E11	E35-E50	E52-E67	E81-E82
E13-E14	E39-E54	E57-E58	E84-E91
E16-E17	E40-E41	E66-E73	E88-E96
E26-E27	E45-E60	E71-E72	E95-E96
E31-E32			

iSBX 217C Magnetic Cartridge Tape Interface, 146050

	PRODUCT HISTORY
-003	Remove unnecessary stake pin (E97). Replace programmed 8742 was 146256 is 146855.
-004	Firmware updated to support operation with new archive tape drives. PROM located at U5 was 146885 is 148439-001.

ON 215 G,
remove : W31/3-2
W24-1/242

5.5 iSBX 218A Flexible Diskette Controller

Specifications

Electrical Characteristics

+5V VDC ± 5% @ 1.6 amps

Functional Description

The iSBX 218A board interfaces with the CPU board or iSBC 215G board through an iSBX Bus connector. Up to four drives of the same size (5.25 or 8") can be controlled by this board. The iSBX 218A is capable of operating Single or Double Sided and Single or Double Density media.

Installation and Removal

1. Remove the iSBX 218A board's host board (either the processor board or the iSBC 215G board) from the cardcage.
2. Remove the iSBX 218A mounting screws.
3. Remove the iSBX 218A board.

Use a reverse procedure for installation.

If the 218A board is mounted on the iSBC 215G board, install the following jumpers; refer to Figure 5-3 for jumper locations:

E6-E7
E5-E8
E9-E10
E11-E14
E16-E17
E22-E23
E24-E25
E28-E29
E31-E32
E33-E48*
E36-E37
E38-E39*
E40-E41
E43-E44
E46-E47*
E49-E50
E53-E54
E56-E57
E58-E59
E61-E62
E64-E65
E66-E67
E68-E69

*If the 218A board is mounted on the iSBC 86/30 remove E46-E47 and E33-E48. Install E33-E34 and E47-E48.

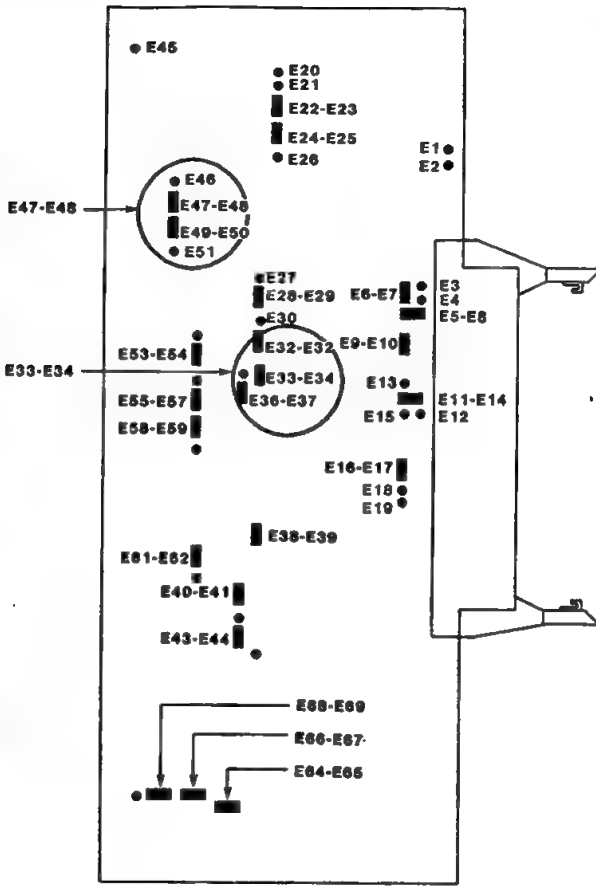


Figure 5-3. 218A Controller Board Jumper Locations

iSBX 218A Flexible Diskette Controller, 172836, PBA 145591

	PRODUCT HISTORY
-004	Add jumper E61-E62 on the 86/30 board in the 218A feature to alleviate booting problem with iRMX. PBA -001
-005	Changed from high to low profile jumper plugs. Replaced capacitors for manufacturability. PBA -002

6.1 Flexible Disk Devices

Specifications

Electrical Characteristics

+5 VDC ± 5% @ .75 amps
+12 VDC ± 5% @ 1.0 amps (1.8A max)

Temperature

Operating 10 to 35 degrees C (50–95 F)
Non-operating 10 to 51 degrees C (50–124 F)

Humidity (system operating)

20 to 80% non-condensing

Transfer Rate

250 kbits/sec (DD)

Access Time

Track to track, 20 msec
Average, 40 track, 275 msec
35 track, 241 msec

Rotational speed

300 rpm

Functional Description

Standard System 310 Flexible disks privide Double Sided/Double Density 48 TPI storage media.

Installation and Removal

1. Turn off the power and disconnect the power cord.
2. Remove the drive by:
   a. removing the cover
   b. cutting the tie wrap from the power wires on the right side of the floppy EMI shield (Rel 1 sheetmetal only)
   c. loosening the two screws on the rear of the floppy mounting plate (behind the peripherals)
   d. Remove the screws from the front of the mounting plate
   e. Lift and slide the mounting plate w/ peripherals forward to remove.
   f. Carefully position the peripheral assembly upside-down on top of the cardcage
   g. Disconnect the power and ribbon cables from the floppy
   h. Remove the four floppy mounting screws
   i. Remove the drive.

Installation is the same as removal except in reverse order.

When replacing a Full-Height drive with a Half-Height use an FCO hardware kit (FCO SYP310-03). This kit includes EMI shield, filler panel and screws.

Verify the correct jumper setting for the Half-Height drive in the appropriate table below.

134188-001 HHFD

DS0	DS1	HS	HM	UR	IU	SM
X			X	X		X

134188-005 HHFD

DS0	DS1	DS2	DS3	U1	U2	HL	IU	DC	RY	XT	FG
X					X				X		X

Each drive must be selected via the Drive Select terminator located on the disk drive circuit board. Cut all pin pairs except the desired Drive Select number DS0, DS1, DS2, etc. on the terminator block. This can be done with a small flat blade screw driver or knife.

Flexible Diskette Drive, 48 TPI, DSDD

	PRODUCT HISTORY
133882	**FHFD Shugart**
-001	Production Release.
134188	**HHFD, 48 TPI, 134188**
-001	Production Release.
-005	Previous drives not available from vendor.

Flexible Diskette Drive, 48 TPI FH DSDD, 172831

	PRODUCT HISTORY
-006	Add grommet to reduce cut wires on power harness. Manufacturing convenience.
-007	Add tie wrap around power cables to eliminate puncturing.
-008	Add Caution label on diskette.
-009	Manufacturing convenience.

6.2 Streaming Tape Drive (Archive 5945C, ¼-inch)

Specifications

Electrical Characteristics

+5 VDC ±5%, .6 Amps
+12 VDC ±5%, 1.6 Amps, 4.4A tape start-stop current

Interface

QIC-2

Operating Temperature

41 to 113 degrees F

Operating Humidity

20 to 80% non-condensing

Capacity

45 Mbytes, DC 300XL tape cartridge (P/N 134423-001)
60 Mbytes, DC 600A tape cartridge

Tape Speed

90 ips

Functional Description

The basic Scorpion Archive ¼-inch Tape drive provides high levels of data integrity, capacity and data rates. Backup time can be nine minutes for 45 Mbytes and 12 for 60 Mbytes.

Removal and Installation

Follow the Flexible Diskette instructions for peripheral removal and installation. Refer to Chapter 13, Preventive Maintanence, for tape drive cleaning and service.

Archive Tape drive 5945, 135818

	PRODUCT HISTORY
-001	Original release
	Tape Formatter board, 135819
-001	Pre-release
-002	Production release, fix 311 support Formatter Firmware released, -010

6.3 Winchester Hard Disk Devices

Specifications

Electrical Characteristics

Table 6-1. Qualified Drives

	Power (amps)			# Cyl/ # Alt	Head	Access Time
	+ 5VDC	+ 12VDC	+ 12VDC (start)			
12M CMI	1.5	2.4	3.5 max	306/10	4	72 ms
19M CMI	1.5	2 4	3.5 max	306/10	6	72 ms
19M Fujitsu	1.5	2 4	3.5 max	306/10	6	72 ms
40M Quantum	1.5	2.0	5.0 max	512/10	8	50 ms
86M Maxtor	1.8	1.6	4.5 max	1024/32	8	30 ms
140M Maxtor	1.8	1.6	4.5 max	918/18	15	30 ms

Operating Temperature

10 to 46 degrees C

Humidity

to 90% non-condensing

Removal and Installation

For removal and installation follow the instructions for flexible disks. Formating instructions are listed in the Operating System or Diagnostic sections.

Drive selection is done from the shunt block. Short the required Device Select number and open the rest. Maxtor 140MB drive select is at J7:DS1 = 5-6, DS2 = 4-5, DS3 = 3-2, DS4 = 2-1.

Transportation

Ensure the head parking routine is done to the Winchester before transportation. Use SDT disk 1A, WIN5 diagnostics—test 1A to position the heads on the diagnostic track.

10MB Winchester Drive, 172830

	PRODUCT HISTORY
-004	Use shorter screws to avoid piercing through drive groundstrap.

226 807
9Uk/SMD

7.1 iSBC 056A Memory Board

Specifications

Electrical Characteristics

+5 VDC ± 5% @ 6.35 amps max.

Memory

256k bytes dynamic RAM

Access Time

350 ns read/write word
530 ns write byte

Memory Partitioning

16 contiguous 16k byte blocks
Base—any 64k byte boundary
—cannot cross 4M byte page boundry

Functional Description

The iSBC 056A provides 256k bytes of MULTIBUS dynamic RAM memory.

Removal and Installation

1. Turn power off and remove AC power cord.
2. Remove the back panel.
3. Pull both ejector tabs simultaneously.

Installation is the same except in reverse order.

Jumper selections are as follows (refer to Figure 7-1 for jumper locations):

2-3	34-35	79-82*	110-111
4-5	37-38	88-89	110-112
6-7	39-45	92-93	110-113
9-13	44-46	94-95	110-114
15-22	47-146	97-98	116-117
18-22	60-65	101-102	118-120
23-24	66-67	103-104	135-136*
26-27	70-71*	105-106	
31-32	76-77	107-108	

*Start address 20000H (128k) with 79-82, 40000H (256k) with 79-81.

*Boards with an 8202 use 70-71, 8203 use 69-70.

*Boards with an 8203 remove 135-136.

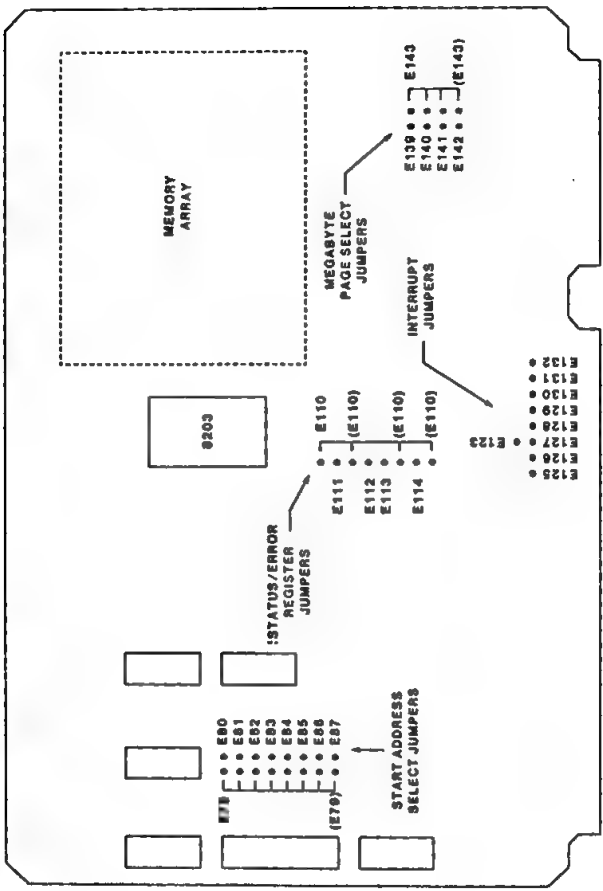


Figure 7-1. SBC 056A Jumper Locations

iSBC 056, Memory, 174019, PBA 145801

	PRODUCT HISTORY
-001	Add feature to Machine Feature Index.
-002	Changed firmware to correct problem with the Error Status Register of the 8206.

7.2 iSBC 012B MULTIBUS Memory Board

Specifications

Electrical Characteristics

+5 VDC ± 5% @ 4.5 amps

Memory

512k bytes dynamic RAM

Access Time

350 ns

Cycle Time

550 ns read/write

Functional Description

The iSBC 012B Memory board provides 512k bytes of MULTIBUS dynamic RAM. Although the board byte parity protection is not used by iRMX or XENIX the diagnostics do check this functionality.

Removal and Installation

1. Turn unit off and disconnect the AC power cord.
2. Remove back panel.
3. Pull both ejector tabs simultaneously.

Installation is the same as removal except in reverse order.

The following jumper list is for standard (default) jumpers. The new and old columns are conversions to both silkscreen versions.

Refer to Figure 7-2 for address selection jumpering (7 to 38, W17 to W32).

New	Old	New	Old
1-2	W33A	57-58	W12A
4-5	W34A	60-61	W11A
42-43	W1	63-64	W10A
44-45	W2	66-67	W9A
46-47	W3	69-70	W8A
48-49	W4	72-73	W7A
51-52	W14A	75-76	W6
54-55	W13A	77-78	W15
121-122	E6-E5	124-125	E3-E2

	Upper Boundary						Lower Boundary								
Start Addr.	7–15 W17	8–16 W18	9–17 W19	10–18 W20	11–19 W21	12–20 W22	13–21 W23	14–22 W24	23–24 W25	25–26 W26	27–28 W27	29–30 W28	31–32 W29	33–34 W30	35–36 W31	37–38 W32
0K	O	O	O	O	O	I	I	I	I	I	I	I	I	I	I	I
64K	O	O	I	I	I	O	I	I	I	I	O	I	I	I	I	I
128K	O	O	O	I	I	O	I	I	I	I	I	O	I	I	I	I
192K	O	O	I	O	I	O	I	I	I	I	O	O	I	I	I	I
256K	O	O	O	O	I	O	I	I	I	I	I	I	O	I	I	I
320K	O	O	I	I	O	O	I	I	I	I	O	I	O	I	I	I
384K	O	O	O	I	O	O	I	I	I	I	I	O	O	I	I	I
448K	O	O	I	O	O	O	I	I	I	I	O	O	O	I	I	I
512K	O	O	O	O	O	O	I	I	I	I	I	I	I	O	I	I
ADDR LINE	0E	0F	10	11	12	13	14	15	0E	0F	10	11	12	13	14	15

I = IN The jumper must be in if a low on the address line is desired.
O = OUT The jumper must be out if a high is desired

W33 and W34 select the 4 megabyte bank desired as follows:

000000H–3FFFFFH	W33A, W34A, 1–2, 4–5 (Factory Default)
400000H–7FFFFFH	W33B, W34A, 2–3, 4–5
800000H–BFFFFFH	W33A, W34B, 1–2, 5–6
C00000H–FFFFFFH	W33B, W34B, 2–3, 5–6

Figure 7-2. iSBC 012B Address Selection Jumpers

iSBC 012B Memory, 172838, PBA 112642

	PRODUCT HISTORY
-004	Add version of stand alone board for manufacturability.

7.3 CX Series RAM Memory Boards

Specifications

Electrical Characteristics

056CX +5 VDC ± 5% @ 6.35 amps
010CX +5 VDC ± 5% @ 6.45 amps
012CX +5 VDC ± 5% @ 6.6 amps
020CX +5 VDC ± 5% @ 6.7 amps

Memory

056CX 256k bytes dynamic RAM
010CX 1024k bytes dynamic RAM
012CX 512k byte dynamic RAM
020CX 2048k bytes dynamic RAM

Partitioning

Base at any 16k byte boundry

MULTIBUS
- 056CX 16 contiguous 16k byte blocks*
- 010CX 64 contiguous 16k byte blocks*
- 012CX 32 contiguous 16k byte blocks*
- 020CX 128 contiguous 16k byte blocks*

iLBX
- 056CX 4 blocks of 64k bytes each
- 010CX 16 blocks of 64k bytes each
- 012CX 8 blocks of 64k bytes each
- 020CX 32 blocks of 64k bytes each

Access Times

MULTIBUS
- 350 ns read/write word
- 530 ns write byte

*cannot cross 4M byte page boundary

iLBX
65 to 406 ns (jumper selectable)
440 ns write

Functional Description

The iSBC CX Series RAM Memory boards provide dynamic RAM accessible via MULTIBUS or iLBX interfaces. CX Series memory boards provide Error Checking, Correction circuitry (ECC) and battery backup. Only soft error correction is supported in 310 Systems. Both soft and hard error circuitry is checked by the diagnostics.

Removal and Installation

1. Turn power off and remove the AC power cord.
2. Remove the back panel screws and panel.
3. Pull both ejector tabs simultaneously.

Installation is the same except in reverse order.

Use the following list to set the common jumpers for all CX series boards. Refer to Figure 7-3 for jumper position.

E1-E2	E27-E32	E86-E87
E5-E6	E28-E35	E88-E89
E8-E17	E29-E34	E91-E99
E10-E11	E38-E68	E106-E107
E13-E14	E39-E55	E109-E110
E19-E20	E70-E76	E130-E140
E22-E23	E80-E81	E145-E146
E24-E25	E83-E84	E148-E149
E26-E30		

Add the following jumpers for the specific CX board.

056CX	010CX	012CX	020CX
E116-E120	E115-E117	E116-E117	E27-E30
E118-E120	E118-E120	E120-E121	E115-E117

When adding a second memory board to the system, strap the jumpers for the second board exactly as if it were the first board as above, with the following exceptions:

Table 7-1 CX Memory Jumper List

When Adding / To	012CX	010CX	020CX
012CX	Remove E83-E84 E91-E99 Add E46-E62 E82-E83 E92-E100		
010CX		Remove E91-E99 E83-E84 Add E45-E61 E82-E83 E92-E100	Remove E83-E84 E91-E99 E106-E107 E109-E110 Add E45-E61 E94-E102 E107-E108 E110-E111
020CX		Remove E83-E84 E91-E99 Add E44-E60 E82-E83 E93-E101	Remove E83-E84 E91-E99 Add E44-E60 E82-E83 E92-E100

Note: Intermittent memory errors may occur with a second 012CX. Remove E130-E140 (interrupt) on the second board only.

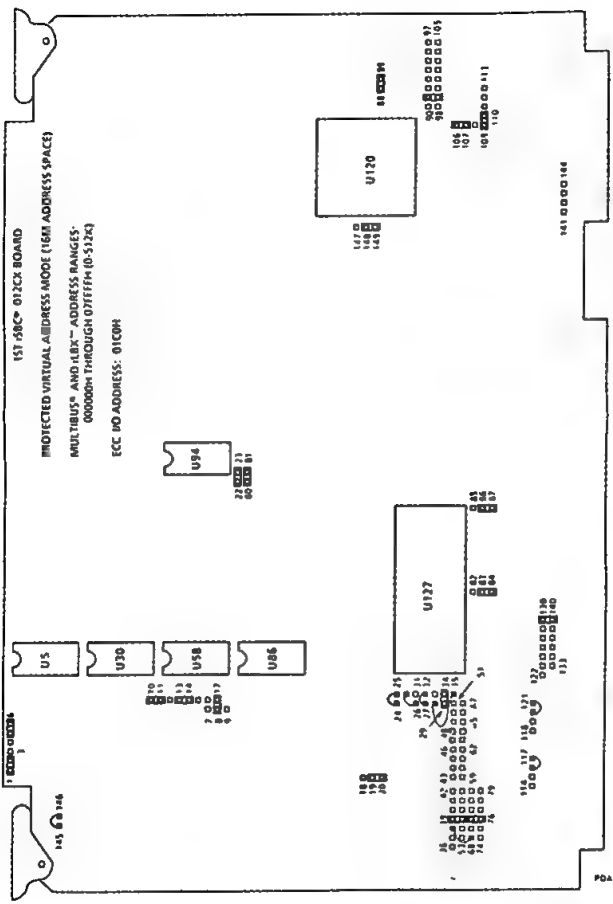


Figure 7-3. iSBC 010CX/012CX/020CX Memory Board

iSBC 012CX 512k bytes Memory

	PRODUCT HISTORY
	Feature 173289, PBA 145801
-002	Add feature to Machine Feature Index and add blocking signal in the arbitration logic.
-003	Replace PROM for diagnostics problem. PBA -015.
-004	Change firmware to correct Error Status Register of the 8206. PBA -023.
	Feature 174275, 896k bytes Memory
-001	Feature added to Machine Feature Index. PBA 145801-015
-002	Change firmware to correct Error Status Register of 8206. PBA 145801-023
	Feature 174274, PBA 145801, 1M byte Memory
-001	Feature added to Machine Feature Index.

7.4 EX Series RAM Memory Boards

Specifications

Electrical Characteristics

010EX +5 VDC ±5% @ 3.4 amps, 5.0A max
020EX +5 VDC ±5% @ 3.7 amps, 5.2A max
040EX +5 VDC ±5% @ 3.9 amps, 5.5A max

Memory

010EX 1 Mbyte dynamic RAM located 0–8 Mb
020EX 2 Mbyte dynamic RAM located 0–16 Mb
040EX 4 Mbyte dynamic RAM located 0–16 Mb

Timing

MULTIBUS
375 ns read write max.
hsi
132 ns min.
250 ns max.
iLBX
116 ns min.
437.5 ns max.

Functional Description

The iSBC EX Series RAM Memory boards provide 8 or 16-bit dynamic RAM accessible via MULTIBUS, iLBX or high-speed synchronous (hsi) interfaces. EX Series memory boards are jumpered default for hsi through P2. Operation in iLBX applications require jumper and PAL (U157, U180 & U181) changes. EX Series memory boards provide parity checking and error reporting circuitry (ECC).

Removal and Installation

Refer to Figure 7-4 for jumper locations. Single EX Series boards are used in their default jumper configuration. All boards contain the jumpers listed below.

E13-E14	E23-E24	E51-E52	E60-E61
E15-E16	E35-E36	E55-E56	E62-E63
E17-E18	E45-E46	E57-E58	E66-E68

All boards must have the jumpering shown above. Select the jumpering for Memory Base Addresses and Board Size from Table 7.2 and Table 7.3 respectively.

Table 7.2 EX Board Size Jumper Configuration

Board Version	BS2 E5-E6	BS1 E1-E2	BS0 E3-E4
012EX ½M byte	out	out	out
010EX 1M byte	out	out	in
020EX 2M bytes	out	in	in
040EX 4M bytes	in	in	in

Notes: BS means Bank Select.
These jumpers are correctly configured at default.
These jumpers are shown on Figure 7-4.

Table 7-3. EX Memory Base Address Select (All Memory Board Versions)

Starting Address[1]				BA3	BA2	BA1	BA0
012EX	010EX	020EX	040EX	E43-E44	E41-E42	E39-E40	E37-E38
000000H[2]	000000H	000000H	000000H	out	out	out	out
040000H	080000H[2]	100000H†	100000H†	out	out	out	in
080000H	100000H†	200000H	200000H	out	out	in	out
0C0000H[2]	180000H[2]	300000H	300000H	out	out	in	in
100000H[2]†	200000H	400000H	400000H	out	in	out	out
140000H	280000H[2]	500000H	500000H	out	in	out	in
180000H	300000H	600000H	600000H	out	in	in	out
1C0000H	380000H	700000H	700000H	out	in	in	in
200000H[2]	400000H	800000H	800000H	in	out	out	out
240000H	480000H[2]	900000H	900000H	in	out	out	in
280000H	500000H	A00000H	A00000H	in	out	in	out
2C0000H[2]	580000H[2]	B00000H	B00000H	in	out	in	in
300000H[2]	600000H	C00000H	C00000H	in	in	out	out
340000H	680000H[2]	D00000H	D00000H[3]	in	in	out	in
380000H	700000H	E00000H	E00000H[3]	in	in	in	out
3C0000H[3]	780000H[3]	F00000H[3]	F00000H[3]	in	in	in	in

[1] The 012EX board starts on 256K-byte boundaries, the 010EX on 512K-byte boundaries, and both the 020EX and 040EX on 1M-byte boundaries.
[2] This address range does not use the top exclusion feature (jumpers TA0 and TA1 are ignored).
[3] The memory map will wrap around for this address range.
† Identifies the default configuration; the starting address is at 100000H.
Notes: BA means Base Address.
These jumpers are shown on Figure 7-4.

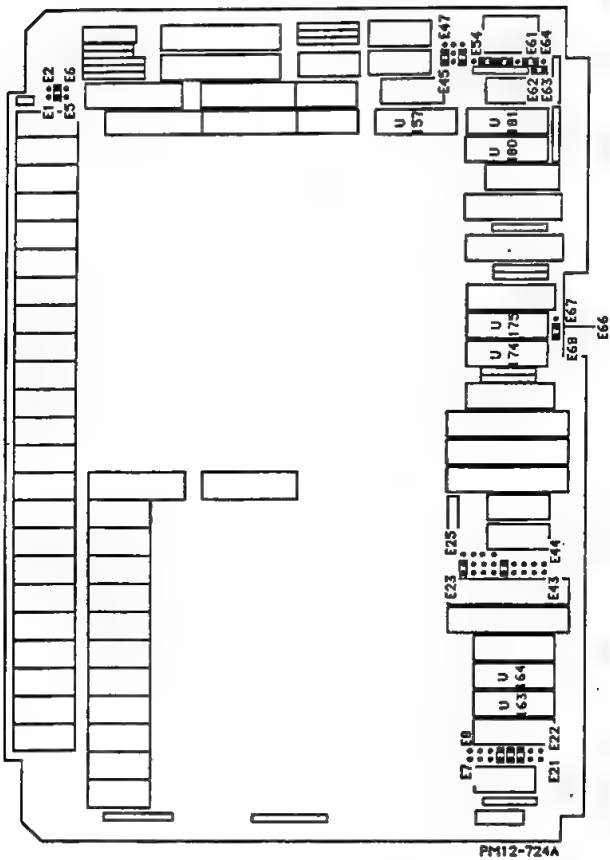


Figure 7-4. iSBC 010EX Main Memory Jumper Configuration

EX Series Memory, PBA 147922

	PRODUCT HISTORY
-006	040 EX Production Release.
-007	020 EX Production Release.
-008	010 EX Production Release.
-011	040 EX. Fix hsi BUS LOCK/ response causing intermittent BUS hangs. Add a wire and change PAL U181 from 148154-001 to 148931-001.
-012	020 EX. Same as for -011.
-013	010 EX. Same as for -011.

8.1 iSBC 188/48 Advanced Communicating Computer

Specifications

Electrical Characteristics

+5 VDC ± 5% @ 7.3 amps
+12 VDC ± 5% @ .2 amps
−12 VDC ± 5% @ .2 amps

CPU clock

6 MHz

Memory

64k bytes dynamic RAM
  16k bytes private
  48k bytes MULTIBUS dual port
  Base-jumper selectable (0f900H default)
to 64k bytes PROM (C0000-FFFFFH selectable)
  16k byte firmware (27128) 0FC000-FFFFFH default

Memory Access

Zero waitstate RAM, PROM

I/O

08A6H default Flag byte

Functional Description

The iSBC 188/48 Advanced Communicating Computer provides 310 Systems with eight serial I/O channels, arranged in pairs of

two channels per connectors. The iSBC 188/48 also supports local processing activity and memory storage and control. The total number of serial I/O channels can be increased to 12 by adding two iSBX 354 MULTIMODULE boards. Each of these boards has its own 82530 component, along with an additional serial I/O connector.

Removal and Installation

1. Turn the power off and disconnect the AC power cord.
2. Remove the back panel screws and panel.
3. Disconnect all cables from the SBC.
4. Pull both ejector tabs simultaneously.

Installation is the same except in reverse order. Be sure to insert the SBC in a non-iLBX slot.

Refer to Table 8-1 for jumpering configuration and Figure 8-1 for jumper locations.

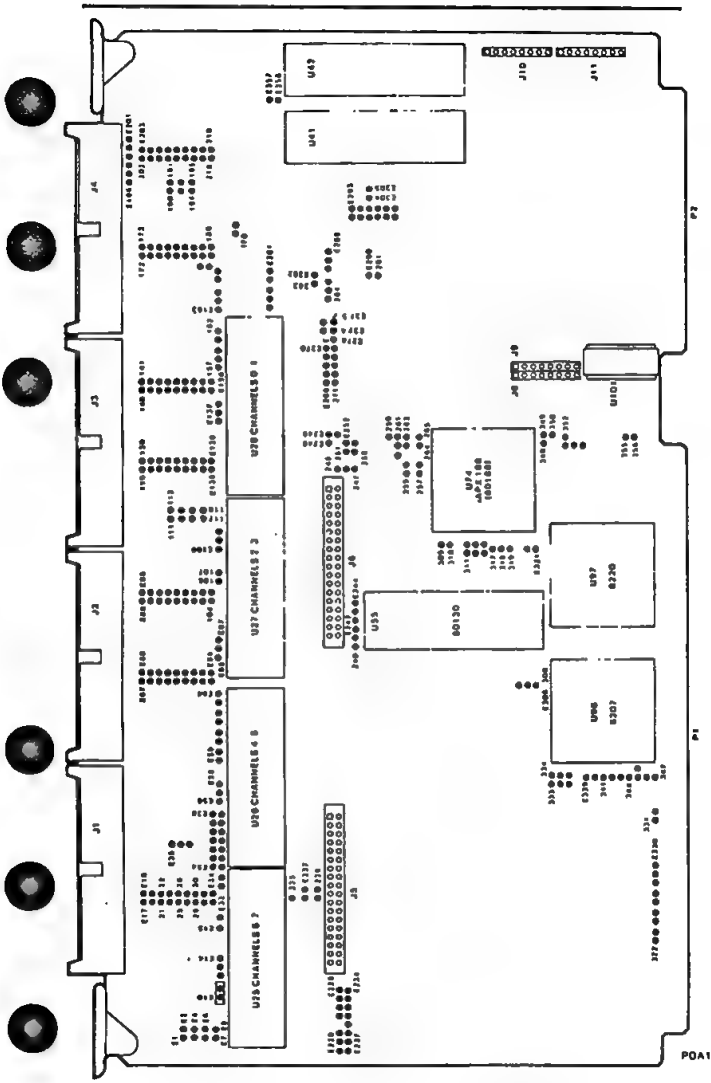


Figure 8-1. iSBC 188/48 Jumper Locations

Table 8-1. iSBC 188/48 Jumper Configuration List

1-2	3-4	5-6	7-8
9-344	10-11	12-13	17-18
19-20	21-22	23-24	25-26
27-28	29-30	33-34	36-37
38-39	40-41	42-43	44-45
46-47	48-49	50-51	54-55
57-58	59-60	61-62	63-64
65-66	67-68	69-70	71-72
73-74	75-76	77-78	79-80
83-84	85-86	88-89	90-91
92-93	94-95	96-97	98-99
100-101	104-105	106-107	109-110
111-112	113-114	115-116	117-118
119-120	121-122	123-124	125-126
127-128	129-130	131-132	135-136
137-138	140-141	142-143	144-145
146-147	148-149	150-151	152-153
156-157	159-160	161-162	164-165
166-167	168-169	170-171	172-173
174-175	176-177	178-179	180-181
182-183	184-185	188-189	190-191
192-193	194-195	198-199	202-203
204-205	206-207	108-109	210-211
212-213	214-215	218-219	220-227
224-225	226-234	231-232	242-243
246-247	248-249	251-252	253-254
255-256	260-261	264-265	277-278
280-281	282-283	284-285	287-288
290-291	292-293	294-295	296-297
298-299	300-301	307-308	315-316
317-318	324-325	326-327	328-329
333-334	335-336	348-349	351-352
374-375			

With ISBX 354 boards attached:

Remove	Add
251-252	251-274
335-336	276-335

iSBC 188/48 Communication Controller

	PRODUCT HISTORY
	Feature 174169, PBA 146427 Version 1.1
-001	Add feature to Machine Feature Index. Manufacturing convenience. PBA -001
-002	Replace 80188 with 80188-6 (B-3 stepping). Correct firmware bug with Suspend/Resume Transmit commands. PBA -002
	Feature 174022 (includes DMA)
-001	Add to Machine Feature Index. PBA 146432-002
-002	Replace 8220 to solve oscillatory noise problem created by address line switching of the 8220. PBA 147208-001
	Feature 175212, DCE
-001	Add to Machine Feature Index. PBA 175213

8.2 iSBC 544 Intelligent Communications Controller

Specifications

Electrical Characteristics

+5 VDC ± 5% @ 2.7 amps
+12 VDC ± 5% @ .33 amps
−12 VDC ± 5% @ .2 amps

Memory

4k or 8k PROM (0000-1FFFH)
16k dynamic RAM (8000-BFFFH jumper select)
256 bytes static RAM (7F00-7FFFH)

Memory access

450 ns min
1100 ns + off-board command duration max.
Zero waitstate static RAM
Dynamic RAM waitstate
On-board—write normal: 1, refresh: 2
—read normal: 0, refresh: 1
Off-board—write normal: 2, refresh: 3
—read normal: 1, refresh: 2

Interface

RS-232C serial
Bell Model 801 Auto Call compatible parallel
iSBC 80 MULTIBUS compatible

Functional Description

The iSBC 544 Intelligent Communications Controller operates as an intelligent slave operating four fully programmable synchronous and asynchronous serial I/O channels with RS232C buffering. The iSBC 544 provides 256 bytes of static RAM (located at 896k), 16k bytes of dynamic RAM and up to 8k bytes of ROM. Baud rates, data formats and interrupt priorities are

individually software selectable for each channel. The iSBC 544 also includes 10 lines of buffered parallel I/O interface which provides compatibility with a Bell 801 Auto Calling Unit.

Removal and Installation

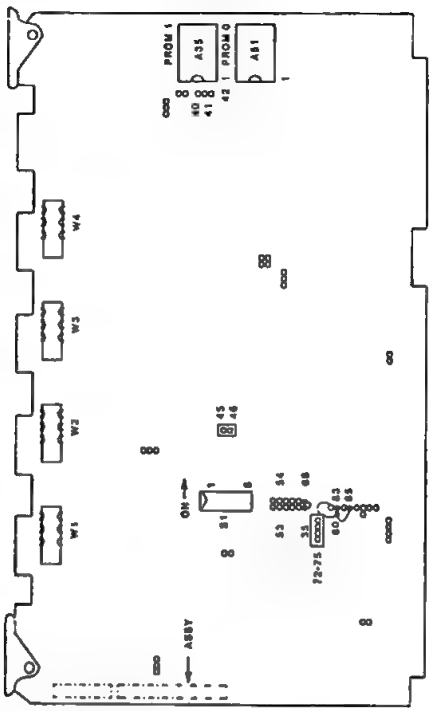
1. Turn power off and remove the AC power cable.
2. Remove the back panel screws and back panel.
3. Pull both ejector tabs simultaneously.

Installation is the same except in reverse order.

Refer to Figure 8-2 for jumper installation and location.

NOTE

Systems with a 311 attached must remove 51-52 and install 53-54 on all 544s.



S1 SWITCH CHART

NUMBER OF BOARDS		SWITCH POSITION	SWITCH SEGMENT	ADDRESS
1	FIRST iSXM™ 544	ON	1,2,3,4,5,7	0E000
		OFF	6,8	
2	SECOND iSXM™ 544	ON	1,2,4,5,7	0E400
		OFF	3,6,8	
3	THIRD iSXM™ 544	ON	1,2,3,5,7	0E800
		OFF	4,6,8	
4	FOURTH iSXM™ 544	ON	1,2,5,7	0EC00
		OFF	3,4,6,8	

JUMPERS

INSTALL	REMOVE
41-42	65-66
45-46	72-73
53-54	74-75
73-74	80-83
80-85	

Figure 8-2. iSXM™ 544 Board Jumper Locations

iSBC 544 Communications Controller, 175297 Version 2.3

	PRODUCT HISTORY
-001	Add to Machine Feature Index. Firmware: A51 175322-001 A35 175322-002

9.1 System Usage

Keyboard Entry Procedures

The response of the monitor to keyboard entries is as follows:

- Accepts all digits, upper or lower case letters, and all other standard keyboard characters.
- Pressing SHIFT and the DEL/ESC key causes the monitor to delete the last character entered (by backspacing). The character is deleted from the display and from the command. The BACKSPACE key deletes the last character entered from the display but not from the command. It should not be used. RUBOUT is not available.
- Pressing CONTROL-C causes the monitor to abort the current command being executed and returns the monitor prompt to the screen. If a program is executing and is in a loop, CONTROL-C has no effect.
- Pressing CONTROL-R causes the monitor to display the current command line entry. If the console is connected directly to the main processor board, CONTROL-R has no effect.
- Pressing CONTROL-X causes the monitor to delete the current command line and display the pound sign (#).
- Pressing CONTROL-S causes the monitor to suspend output to the screen at the current cursor position. The remaining output is not lost, but is held in the buffer.
- Pressing CONTROL-Q causes the monitor to resume output to the screen, suspended by CONTROL-S, starting at the current cursor position.
- Pressing RETURN signals completion of command entry.

Spaces may be entered anywhere in the command line except within logical elements. Command lines may be up to 255 characters in length.

Line Editing Commands

Line editing commands can be used to correct errors made while entering commands. A command line may be edited repeatedly until a RETURN or LINE FEED is entered.

Table 9-1. Line Editing Commands

Edit Command	Action Required	System Response
<CR>	Press keyboard RETURN key.	Carriage return to terminate command entry and initiate execution.
CONTROL-P	Press CONTROL key while typing P.	Inputs next character literally.
CONTROL-R	Press CONTROL key while typing R.	Echoes entire input line.
CONTROL-X	Press CONTROL key while typing X.	Deletes entire input line.
CONTROL-Z	Press CONTROL key while typing Z.	Same as CONTROL-X.
ESCAPE	Press keyboard ESC key.	Cancels entire input line.
LINE FEED	Press keyboard LINE FEED key.	Terminates command entry.
SHIFT ESC/ DEL or RUBOUT	Press keyboard SHIFT ESC/DEL keys or RUBOUT key.	Deletes last character typed on the input line.

Table 9-2. Monitor Commands

Command	Function and Syntax
L (LOAD)	Load an absolute object file into system memory. L *filename* RESTRICTED USE.
G (GO)	Transfer control of CPU to user program. G[*start-addr*][, *break-addr*, { *range* }]
R (LOAD AND GO)	Load an absolute object file into system memory and begin execution. R *filename* RESTRICTED USE
T (UPLOAD)	Load a block of memory into a file. T *range*, *filename* [, *start-addr*] RESTRICTED USE
N (SINGLE-STEP)	Display and execute one instruction at a time. [*cont*] N [O] [P] [Q] [*start-addr*]
X (EXAMINE)	Display or modify CPU registers. X [*reg* [= *expr*]]
D (DISPLAY)	Display contents of memory. [*cont*] D [W { X? } [*range*][,]
S (SUBSTITUTE)	Display/modify memory locations. [*cont*] S [W]*addr* [= *expr*][/expr]*[,]
M (MOVE)	Move the contents of a block of memory. M*range* , *dest-addr*
F (FIND)	Search a block of memory for a constant. F*range* , *data*
C (COMPARE)	Compare two blocks of memory. C*range* , *dest-addr*
I (INPUT)	Input and display data from input port. [repeat] I [W]*port-addr*
O (OUTPUT)	Output data to output port. [repeat] O [W]*port-addr* , *data*
P (PRINT)	Print values or literals. P [IT { S { Q? } [*addr* { *expr* { *literal*?] [, *addr* { *expr* { *literal*?]*
E (EXIT)	Exit the loader program and return to the operating system. E RESTRICTED USE
* (COMMENT)	Remainder of entry line is commentary. * *comment*
B (BOOTSTRAP)	Bootstrap the code from disk to main memory. B[*pathname*]

Table 9-3. Master Processor CPU Registers

Register Abbreviation	Register Name
AX	Accumulator
BX	Base
CX	Count
DX	Data
SP	Stack Pointer
BP	Base Pointer
SI	Source Index
DI	Destination Index
CS	Code Segment
DS	Data Segment
SS	Stack Segment
ES	Extra Segment
IP	Instruction Pointer
FL	Flag

9.2 SDT—System Diagnostic Tests

The System Diagnostic Tests are used for detecting system hardware malfunctions. Results of the SCT should be used to determine the proper SDT to be executed.

The SDT diagnostics reside on the diagnostic diskettes shipped with the system. Systems using the iRMX 86 Operating System should have the tests installed on the Winchester disk. Systems other than iRMX 86 must invoke the SDTs from floppy.

All SDTs are invoked from the monitor prompt. The command syntax is as follows.

86-Based Systems

`b /SDTDIR/`*`filename`* for Winchester boot and
`b :wf0:/SDTDIR/`*`filename`* from flexible disks.

286-Based Systems

`b /SDTDIR.286/`*`filename`* for Winchester boot and
`b :wf0:/SDTDIR.286/`*`filename`* for floppy boot

Filenames are listed below for each diagnostic disk.

1A	1B
SDTRAM	SDT309
SDTWIN5	SDT337
SDT218	SDT351
SDT8630	SDT534
SDT8612	SDT544

Use SDT8630 for systems with the 86/35 CPU board.

SDT Commands

A brief summary of diagnostic commands are listed below. For more detailed information on command syntax refer to the *System 286/300 Series Diagnostic Software User's Guide*, no. 173767.

`DEScribe`	displays the master list of tests.
`T, Test`	begins execution of all recognized tests.

`T 4,7,9`	executes test 4, 7 and 9 respectively.
`IGNore n`	causes test number *n* to be skipped during the test sequence.
`RECognize n`	allow test *n* to executed in sequence.
`SUM E0`	Summary of Error Output, displays the list of tests which failed.
`Cntl-C`	aborts execution.
`EXIt`	terminates SDT session and exits to monitor.
`DEB = 1`	enables printing detailed debug messages or status.
`DEB = 0`	disables debug messages.
`CLEar`	resets the execution and error count values.
`RESet SOFtware`	restarts the diagnostics from the beginning.
`RESet HARdware`	resets the system hardware.

SDT Description

SDT8630 checks the processors' CPU, USART, ROM, RAM, PPI, Timer and the associated gating circuitry on the iSBC 86/30 board. It also test portions of the iSBC 215 Winchester Disk Controller board. Tests include:

0 ROM CHECKSUM
1 PARALLEL PORT TEST
2 PIC INTERUPT TEST
3 8253 TIMER TEST
4 FIXED PATTERNS
5 ADDRESS MARCH
6 SLIDING ONES
7 RAM CONTENTION

SDT8612 checks the processors' CPU, USART, ROM, RAM, PPI, Timer, and the associated gating circuitry on the iSBC 86/12A board. It will also test portions of the iSBC 215 Winchester Disk Controller board.

Tests include:

0 ROM CHECKSUM
1 8255 PARALLEL PORT TEST
2 8259 INTERUPT TEST

3 8253 TIMER TEST
4 FIXED PATTERNS
5 FIXED PATTERNS iSBC 300
6 SLIDING ONES
7 SLIDING ONES iSBC 300
8 DUAL PORT RAM CONTENTION TEST
9 RAM MEMORY MAPS

SDT218 checks the functionality of the disk controllers by verifying the co-processor, ROM, RAM and other circuitry on the iSBC 215 Winchester Disk Controller board as well as the circuitry on the iSBC 218A Flexible Diskette Controller board.

Tests include:

0 FORMAT TEST
1 SEEK/VERIFY TEST
2 WRITE/READ TEST
3 DRIVE SELECTION TEST
4 PLATTER/HEAD TEST
5 SECTOR SELECTION TEST
6 TRACK VERIFY TEST
7 PLATTER VERIFY TEST
8 WRITE/READ DELETED DATA TEST

SDTWIN5 provides complete Winchester disk utilitities and fault analysis. The disk controller circuits are also excercised in these tests.

Tests include:

0 RESET/INITIALIZE DISK TEST
1 ROM CHECKSUM TEST
2 RAM WINDOW TEST
3 RAM ADDRESS TEST
4 TRANSFER STATUS TEST
5 BUFFER I/O TEST
6 FORMAT DIAGNOSTICS TRACKS
7 MICRO-DIAGNOSTICS TEST
8 VERIFY FORMAT/FORMAT TEST
9 SEEK/VERIFY TEST
0A WORST CASE SEEK TEST
0B WRITE/READ/VER. DIAG. TRACK
0C DRIVE SELECTION TEST
0D PLATTER/HEAD SELECTION TEST
0E SECTOR SELECTION TEST
0F OVERLAP SEEK TEST

10 ALTERNATE TRACK TEST
11 ZERO FILL TEST
12 DATA OVERRUN TEST
13 AUTO-INCREMENT TEST
14 ALL WRITE/READ/VERIFY TEST
15 RANDOM WRITE/READ/VERIFY TEST
16 SELECT NEXT DRIVE UNDER TEST
17 FORMAT UTILITY
1A UNLOAD HEADS FOR SHUTDOWN
1B DISPLAY/EDIT DEFECTIVE LIST
1C DISPLAY/CLEAR ERROR LOG UTIL.

SDTRAM aids in detecting and isolating faults on the memory boards. These tests support A, B, C and CX series boards, ECC/parity and limited support for no-parity boards. SDTRAM may be used to test memory boards other than those listed but does not test ECC/parity.

Tests include:

0 FIXED PATTERNS
1 ADDRESS MARCH
2 SLIDING ONES
3 EXECUTE FROM RAM
4 A-SERIES PARITY LOGIC AND RAMS
5 A-SERIES INTERUPT DETECTION
6 C-SERIES CHECK BIT LOGIC
7 C-SERIES CHECK BIT RAMS
8 C-SERIES ERROR CORRECTION
9 C-SERIES INTERUPT DETECTION

SDT337 checks functionality of the 8087 Numperic Data Processor extention. A single test is provided; 0 TEST EXECUTION

SDT309 verifies memory mapping and protection features of the iSBC Memory Management board.

Tests include:

0 INTERUPT PROCESSING
1 EXCEPTION CONDITIONS
2 PHYSICAL ADDRESS VERIFICATION
3 MEMORY BOUNDS TEST
4 MEMORY ACCESS TEST
5 DMA I/O OPERATION TEST

SDT351 provides fault detection in iSBX 351 Serial MULTIMODULE boards. Tests include:

0 PIT INITIALIZATION
1 USART INITIALIZATION
2 USART INTERUPTS
3 BAUD RATE VERIFICATION
4 CHARACTER TRANSMITTER TEST
5 CHARACTER REVEIVER TEST

SDT534 allows fault isolation in one or more iSBC 534 Communication boards. The iSBC 534 runs in the test mode for all tests except 8 and 9 which run in normal operational mode.

Tests are:

0 TIMER INITIALIZATION
1 USART INITIALIZATION
2 PIC INITIALIZATION
3 PARALLEL PORT C
4 USART INTERUPT VERIFICATION
5 TIMER 4 AND 5 INTERUPT VERIFICATION
6 BAUD RATE VERIFY
7 USART LOAD TEST
8 USART CHARACTER TRANSMIT TEST
9 USART CHARACTER REVEIVE TEST

SDT544 provides board level readiness tests for the iSBC 544 Communications Controller. Tests include:

0 MULTIBUS RAM TEST
1 FIRMWARE JUMPOUT COMMAND TEST
2 DUAL PORT RAM TEST
3 BOARD INTERUPT TEST
4 FIRMWARE VERIFICATION
5 PIT INITIALIZATION
6 USART INITIALIZATION
7 PIC INITIALIZATION
8 PPI PORT A INITIALIZATION
9 USART INTERUPT VERIFICATION
0A BAUD RATE VERIFICATION
0B CHARACTER TRANSMIT TEST
0C CHARACTER RECEIVE TEST

	PRODUCT HISTORY

9.3 Running the SCT

The System Confidence Test (SCT) resides in PROM on the processor board and is automatically invoked when the system is turned on or reset. The SCT allows you to quickly determine if major components of the system are malfunctioning.

To invoke the SCT proceed as follows:

1. About five seconds after the system is turned on, the CRT prints an asterisk (86 SCTs print a series of asterisks), from the previous cursor position.

NOTE

The asterisks may not be displayed if the terminal is not set for 9600 baud.

2. After a 12-second delay (or 21 asterisks are displayed), the SCT assumes basic parameters about the terminal (9600 baud rate, no parity and one stop/start bit) and runs an abbreviated version of the SCT which does not require user input.
3. To run enhanced SCTs, user input is required. Enter an uppercase "U" before the 12 second delay. Input is requested when testing the Programmable Interrupt Controller to determine the level of testing and the action upon successful completion of the SCT. Unsucessful test conclusions always exits to monitor. During the six second pause for input, one of the following commands can be used:

.	—	Exits to monitor after displaying enhanced test messages.
|	—	Displays detailed extendend test messages, exits to monitor.
M	—	(86 only) Displays extended messages, exits to monitor.
cntl-c	—	Abort tests, exits to monitor.
none	—	"Interupt Timeout" finishes enhanced test, exits to monitor.
any character or <cr>	—	Completes enhanced tests, exits to boot from default device.

4. SCTs may be bypassed with a two-finger reset (i.e., press the reset button immediately followed by pressing the interrupt button.)

NOTE

Bypassing the SCTs will leave the hardware in uninitialized states. SDT and MDDX diagnostics will not run correctly without establishing a known SCT machine status.

5. If failures occur, refer to Chapter 11, Troubleshooting, for corrective action.

Using the 286 SCT Monitor Extension

The 286 SCT Monitor Extension is a special subset of commands that use the system debug monitor (SDM) command line. At the monitor prompt (".") enter commands as noted in the following tables for extended test descriptions and operating instructions.

Table 9-4. 286 SCT Monitor Extension Commands

Task	Enter
To display the available on-line help menus: Help Directory ''wh'' = This Help Directory ''whc'' = Command Syntax ''wht'' = Tests Directory ''whu'' = Utils Directory ''whv'' = Version Information	wh
To display a one-screen tutorial on command syntax for the looping and repeat commands. Use these commands to cause a test or series of tests to be repeated.	whc

Table 9-4. 286 SCT Monitor Extension Commands (Cont'd)

Task	Enter
To display the menu of all standard and optional test routines: Tests Directory ''wt 0'' = 80286 Register Ops ''wt 1'' = 80286 Memory Ops ''wt 2'' = 27256 EPROM ''wt 3'' = 8254 PIT ''wt 4'' = 8259A PIC ''wt 5'' = 8274 MPSC ''wt 6'' = 8255 PPI ''wt 7'' = 8274 MPSC ChA Loopback ''wt 8'' = :lp: Loopback ''wt 9'' = RAM Memory ''wt A'' = RAM User Patterns test ''wt B'' = :w0: Wini ''wt C'' = :w1: Wini ''wt D'' = :wf0: Floppy ''wt E'' = :wf1: Floppy ''wt F'' = :wta0: Tape	wht
To start a test running enter the *test* number as listed in the Tests Directory menu. For some tests, prompts will be displayed for you to respond to.	wt *test*
To display the utility menu: Utils Directory ''wu 0'' = Testing Summary ''wu 1'' = Clear Testing Summary ''wu 2'' = Set SCT Display Mode ''wu 3'' = Set Stop on Error ''wu 4'' = Display Disk IOPB ''wu 5'' = Clean Floppy Disk Heads	whu
To run a utility program enter the utility number as listed in the Utils Directory menu.	wu *utility*

Utility Descriptions

Table 9-5. Utility Description

Utility	Task	Enter
Testing Summary	To display a summary of all SCT command-line testing, including the number of test attempts and failures for each test. Any test that fails is highlighted by an arrow in the right margin.	wu 0
Clear Testing Summary	To clear the testing summary to all zeros.	wu1
Set SCT Display Mode	To select the level of test result details you want to see: NORMAL — Simple messages such as PASS and FAIL as eash subsystem passes a test VERBOSE — Additional test status information SUPERDEBUG — Exhaustive test status information	wu 2
Set Stop on Error	To set the SCT to stop when an error condition exists.	wu 3
Display Disk IOPB	To view the Winchester controller's parameter block data structures based on wakeup address 0100:0000H. The system looks up the data, formats it and displays it on the screen.	wu 4

Table 9-5. Utility Description (Cont'd)

Utility	Task	Enter

Clean Floppy Disk Heads	To clean the flexible disk drive heads (up to four drives, either 5¼-inch or 8-inch). After selecting the utility, respond to these screen prompts:
	`Select DRIVE TYPE`
	`''0'' = 5.25''`
	`''1'' = 8.00''`
	`Enter [0H .. 1H]`
	--- 	
	`Select DRIVE UNIT`
	`Enter [0H .. 3H]`
	--- 	
	`Insert Cleaning Diskette, then Select`
	`Cleaning Track`
	`Enter [1H .. DH]`
	--- 	
	While cleaning is in progress, the screen displays:
	`cleaning :wfn: #...`
	where *n* = the drive unit being cleaned, followed by one "." for each second the test lasts.
		wu 5

	PRODUCT HISTORY

10.1 General Preventive Maintenance

Preventive maintenance for the System 310 consists of cleaning the read/write heads in the flexible diskette and tape drives, inspecting the various components of the system, and correcting potential problems.

Each time the System 310 is serviced (for example, during head cleaning or when new components are added) perform a general check of the system's condition, as follows:

1. Thoroughly check the system's operation by running the diagnostic programs. Make sure that both fans are operating.
2. Check the installation: see that there is adequate space around the cabinet for ventilation and that the fans are not blocked.

   Make sure that the system is operating within the environmental limits specified in Chapter 2 of this manual. The System should not be operated in areas where it can be severely jarred or subjected to high humidity or vibration.
3. Remove the top cover and I/O panel and check for broken or loose wires, improperly seated circuit boards or connectors, and broken or loose components.

   Make sure that the interconnecting cables are not being chafed or pinched by the equipment and that the connectors are secure.

10.2 Flexible Diskette Head Cleaning

The read/write heads in the flexible diskette drives must be cleaned every 12 months or after 150 hours of drive use. Use the following procedure to do this.

Equipment Required

In order to clean the diskette drive heads, you must have the following items:

- A diskette drive head cleaning kit having a standard 5¼" cleaning diskette and a container of isopropyl alchohol. (Isopropyl alchohol is the only approved solvent for head cleaning.) Head cleaning kits are available from several manufacturers.
- SCT V2.0 or greater: refer to the SCT section for instructions.
- The SDT218 test program, located either on the Winchester disk or flexible diskette. The SDT218 program belongs to the System 300 Series Diagnostic Software package.
- A video display terminal connected to the system. The terminal should be set up for 9600 baud operation, with parity off.

Using the Head Cleaning Utility Program

The head cleaning utility program is a part of the SDT218 system diagnostic test program for the iSBX 218A Flexible Disk Controller and diskette drives. To use the head cleaning utility, you must call up SDT218, as shown in the SDT section.

As soon as SDT218 is loaded into memory, it displays the message

```
SYSTEM DIAGNOSTIC TEST-218 Vx.y

Copyright 1983 Intel Corporation.
```

where Vx.y is the version of the test that you are using.

At this point SDT218 begins to ask you for input from the keyboard, as follows:

1. When SDT218 displays the message

```
ENTER CODE OF DEVICE TO BE TESTED:
  [0] DEFAULT 8" FLOPPY
  [1] DEFAULT 5.25" FLOPPY
  [2] OTHER
```

enter 2<CR> on the keyboard.

2. When SDT218 displays the message:

```
ENTER CODE FOR MEDIA SIZE:
  [0] 8"
  [1] 5.25"
```

enter 1<CR>.

3. W3en SET218 displays the message:

```
IS UNIT 0 BEING TESTED? (Y OR [N])
```

enter Y<CR> if you are cleaning drive 0's heads; otherwise press <CR>.

If you answer no, SDT218 goes on to ask if you are testing Units 1, 2, and 3. Answer yes only for the drive whose heads you want to clean.

If you answer yes, SDT218 asks about the characteristics of the drive.

4. When SDT218 displays the message:

```
IS THIS UNIT BACKED UP?
```

press <CR>.

5. When SET218 displays the message

```
SPECIFY DECIMAL NUMBER OF BYTES PER SURFACE:
[nnT]
```

where [nnT] represents the default setting, enter 40 for 48 tpi drives, or 80 for 96 tpi drives. If the default setting is correct, simply press <CR>.

6. When SDT218 displays the message

```
SPECIFY DECIMAL NUMBER OF SECTORS PER SURFACE:
[nnT]
```

press <CR>.

7. When SDT218 displays the message:

```
SPECIFY DECIMAL NUMBER OF BYTES PER SECTOR:
[nnT]
```

Press <CR>.

At this point SDT218 may ask if you are testing units 1, 2, or 3, depending on your previous (step 6) answers.

Press ⟨CR⟩.

8. When SDT218 displays the message:

   ENTER A 1 TO 5 DIGIT DECIMAL RANDOM NUMBER SEED: [*nT*]

   press ⟨CR⟩.

9. When SDT218 displays the message:

   DO YOU WISH TO USE THE UTILITY TESTS: (Y OR [NO])

   enter Y⟨CR⟩.

10. If the flexible diskette controller is mounted on the Winchester controller (Winchester drive installed), enter REC 33⟨CR⟩ on the keyboard.

    If the flexible diskette controller is mounted on the processor board (no Winchester), enter REC 31⟨CR⟩.

11. Next, you must tell the SDT218 which area on the cleaning diskette to use, as follows:

    V(b)=*n*⟨CR⟩

    where n is a number between 1 and 12 representing an unused track on the cleaning diskette. If track 3 was used last, for example, enter V(b)=4⟨CR⟩. As each track is used, it should be marked off in the area provided on the cleaning diskette's jacket. See the instructions with the head cleaning kit.

12. Prepare the cleaning diskette using isopropyl alcohol and insert it into the drive to be cleaned.

13. Enter:

    TEST 31⟨CR⟩ (no Winchester installed)

    or

    TEST 33⟨CR⟩ (Winchester installed)

14. As the head cleaning utility runs, it loads the head against the cleaning diskette for 30 seconds. It also displays a series of "FAIL" messages on the terminal—ignore these.

    When finished, SDT218 displays the message:

    Head cleaning complete - remove cleaning diskette
    0033H CLEAN HEAD Utility ''FAILED''

10.3 Tape Drive Head Cleaning

Clean the read/write/erase head assembly and the tape hole sensor openings with a clean, lintless cotton swab dampened with a proper head cleaning solution or 95% isopropyl alcohol. Use the following schedule:

1. After an initial pass with a new tape cartridge.
2. If using all new tape cartridges, after every 2 hours of actual use.
3. After every 8 hours of normal use.

The procedure for cleaning the heads is as follows:

1. Ensure that power to the tape drive is off.
2. Move the slide lever to extend the head assembly into the cartridge area.
3. Use a six-inch or longer cotton swab. Move the swab in and out to clean the heads.
4. Take care that excess cleaner is not applied to adjacent parts and that all residue is completely removed prior to inserting the tape cartridge.

The purpose of this section is to help you determine the cause of malfunctions within the System 310. The procedures given here are intended primarily to isolate problems to a field-replaceable module or assembly.

11.1 Using Diagnostic Programs

There are three diagnostic programs that you can use in troubleshooting the System 310.

1. The System Confidence Test (SCT), which is contained in PROM on the processor board, is executed each time the system is powered up, or when the RESET switch is pressed. The SCT is primarily a "go/no go" test that indicates whether or not a particular subsystem is functional (see Table 14-1).
2. The System Diagnostic Test (SDT) and System Analysis Test (SAT) are contained on a flexible diskette or the Winchester drive and must be loaded into system memory to be used. The SDT and SAT both perform extensive and detailed testing on the various subsystems and can provide information on the cause of a malfunction.
3. iMDDX (Intel Menu-Driven Diagnostic Executive) is contained on a flexible diskette or the Winchester drive. Several diskettes are used; one contains the Executive monitor and the others contain separate subassembly tests.

86 SCT Test Results

Table 11-1. Abnormal 86 SCT Test Results

Test	Position 1 2 3 4	Meaning	Corrective Action*
USART		If GO is not displayed	Replace processor board.
PIC	?	TMR0 Interupt did not occur	Replace processor board.
	. ?	Transmit Interrupt did not occur	Replace processor board.
	. . ?	Receive Interrupt did not occur	If key was pressed, replace processor board.
ROMCKSM	?	Checksum variation	Replace processor board.
PPI	?	Failure at Port A	If the ISDM 86 download link is connected, this might not be an error; otherwise, replace processor board.
	. ?	Failure at Port B	Replace processor board.
	. . ?	Failure at Port C	Replace processor board.
RAM TEST			
ONBOARD NO GO		Memory fault	Replace processor board.
OFFBOARD NO GO		Memory fault	Replace memory board.
EXTENDED NO GO		Memory fault	Replace user-added memory board

Table 11-1. Abnormal 86 SCT Test Results (Cont'd)

Test	Position 1 2 3 4	Meaning	Corrective Action*
WINCHESTER	?	Initialization error	If RAM test also fails, replace RAM board; otherwise, perform the following steps, running SDT215 after each step to determine if error still occurs: 1. Ensure that head is unlocked. 2. Run DISKVERIFY to check disk format. 3. If damaged, reformat disk (this destroys data on disk). 4. Replace disk controller board. 5 Replace Winchester drive or boards
	. ?	iSBC 215 Diagnostic	Perform the following steps, running SDT215 after each step to determine if error still occurs· 1. Ensure that head is unlocked. 2. Run DISKVERIFY to check disk format 3. If damaged, reformat disk (this destroys data on disk). 4. Replace disk controller board. 5. Replace Winchester drive or boards.
	. . ?	Controller interrupt did not occur.	If PIC Test failed, replace processor board, else controller board.

Table 11-1. Abnormal 86 SCT Test Results (Cont'd)

Test	Position 1 2 3 4	Meaning	Corrective Action*
FLOPPY NOT READY		Door Opened (does not prevent loading of Operating System)	Insert diskette, close door, press RESET.
	?	Unformatted Diskette, or disk controller reported an error	Perform the following steps, running SDT215 after each step, to determine if error still occurs: 1. Run DISKVERIFY to check disk format. 2. If damaged, reformat disk (this destroys data on disk). 3. Replace disk controller board. 4. Replace disk drive.
TAPE	?	Controller reported error	Perform the following steps, running SDT217 after each step, to determine if error still occurs: 1. Run SDT217 to check tape drive. 2. Replace tape controller board. 3. Replace tape drive.

* If more diagnostic information is needed, invoke the appropriate System Diagnostic Test (SDT).

286 SCT Test Results

Table 11-2. Abnormal 286 SCT Test Results, Boot Subsystem Tests

Message	What to Do
RESET ERROR	1. Make sure the drive controller board and cables are properly installed. 2. Check the memory subsystem for either an addressing error or memory overlap. 3. Check the backplane for shorts or stuck lines. 4. Replace the controller board.
INITIALIZE ERROR	1. Make sure the Winchester disk is correctly formatted. 2. Check the integrity of all control and data cables. 3. Check all power cables for proper connection (the drive select LED should be on). 4. Replace the controller board. 5. Replace the Winchester disk drive.

Table 11-3. Abnormal 286 SCT Test Results, Winchester Test

Message	What to Do
RESET ERROR	1. Make sure the device controller board is properly installed. 2. Check the memory subsystem for either an addressing error or memory overlap. 3. Check the backplane for shorts or stuck lines. 4. Replace the controller board.
INITIALIZE ERROR OR Transfer Status UNIT NOT READY	1. Make sure the Winchester disk is correctly formatted. 2. Check the integrity of all control and data cables. 3. If this error occurred after the read operation, make sure the device label is correct. 4. Check all power cables for proper connections. The drive select LED should be on. 5. Replace the Winchester disk drive. 6. Replace the controller board.

Table 11-3. Abnormal 286 SCT Test Results, Winchester Test (Cont'd)

Message	What to Do
READ ERROR	1. Make sure the Winchester disk is correctly formatted. 2. Check the integrity of all control and data cables. 3. Replace the Winchester disk drive. 4. Replace the controller board.
WRITE/READ MICRO	1. Make sure the Winchester disk's diagnostic track is formatted. 2. Make sure the device label is correct. 3. Check the integrity of all control and data cables. 4. Replace the Winchester disk drive. 5. Replace the controller board.
RECAL	1. Check the integrity of all control and data cables. 2. Replace the Winchester disk drive. 3. Replace the controller board.
CONTRL INTERRUPT	1. Make sure the drive controller interrupt jumpering is correct. 2. Check the processor interrupt jumpering. 3. Replace the controller board. 4. Replace the processor board. 5. Check the backplane for shorts or stuck lines.

Table 11-4. Abnormal 286 SCT Test Results, Floppy Tests

Message	What to Do
OFFLINE	If the boot device cannot be initialized, its status is examined to determine if it is in an UNREADY state (no diskette installed or drive is disconnected), in which case, it is reported OFFLINE. This is not considered an error.
FLOPPY: Reset Error	1. Make sure the controller board is properly installed. 2. Check the memory subsystem for an addressing error or memory overlap. 3. Replace the controller board.
FLOPPY: Initialization Error	1. Check that the flexible disk is properly inserted in the drive. 2. Check the integrity ov all control and data cables. 3. Replace the controller board. 4. Replace the flexible disk drive.
FLOPPY: Read Error	1. If a XENIX tar disk is used in this test, this error message will be displayed. Only XENIX boot disks should be used. 2. Verify that cylinder 0, head 0 of the flexible disk is formatted for single density 128 byte blocks. 3. Check the integrity of all control and data cables. 4. Clean the flexible disk drive heads. 5. Replace the flexible disk drive. 6. Replace the controller board.
FLOPPY: Recal Error	1. Check the integrity of all control and data cables. 2 Check all power cables for proper connection. 3. Replace the flexible disk drive. 4. Replace the controller board.
FLOPPY: Controller Interrupt Error	1. Check the interrupt jumpering on the controller board. 2. Check the interrupt jumpering on the processor board. 3. Replace the controller board. 4. Replace the processor board.

Tape Test (SCT Monitor Extension Only)

This test is invoked by the "Wtf" command in the SCT Monitor Extension. The test resets the controller, initializes the controller and the tape drive, loads the tape and reads the first block on the tape (block 0). If a failure occurs, one or more of the following messages is displayed:

Table 11-5. Abnormal 286 SCT Test Results, Tape Test

Message	What to Do
OFFLINE	If the boot device cannot be initialized, the system determines whether it is in an UNREADY state, in which case, it is reported OFFLINE. This is not considered an error. The message may also mean that the drive is not installed.
TAPE: Reset Error	1. Make sure the controller board is properly installed. 2. Check the memory subsystem for either an addressing error or memory overlap. 3. Check the backplane for shorts or stuck lines. 4. Replace the controller board.
TAPE: Initialization Error	1. Make sure the controller board is properly installed. 2. Check the integrity of all control and data cables. 3. Check all power cables. 4. Make sure the tape drive is properly installed. 5. Replace the controller board.
TAPE: Load Error	1. Make sure the tape in the drive is properly formatted. 2. Check the integrity of all control and data cables. 3. Check all power cables. 4. Replace the tape drive. 5. Replace the controller board.
TAPE: Read Error	1. Make sure the tape in the drive is properly formatted. 2. Check the integrity of all control and data cables. 3. Check all the power cables. 4. Replace the tape drive. 5. Replace the controller board.

Table 11-5. Abnormal 286 SCT Test Results, Tape Test (Cont'd)

Message	What to Do
Tape Reset	1. Check peripheral controller board. 2. Check the power cables for proper connection. 3. Check the power supply.
Transfer Status	1. Check peripheral controller board. 2. Check the power cables for proper connection 3. Change tape cartridge. 4. Replace drive.
iSBX 217C COMMAND REJECTED	1. Check the cables for proper connections. 2. Replace the cables.
INVALID COMMAND	1. Check the cables for proper connection. 2. Replace the controller board.

11.2 DC Power Problems

The most obvious cause of complete system failure is lack of AC or DC power. You can quickly check the outputs of the power supply as follows (see Figures 11-1 thru 11-3):

1. If the "ON" indicator on the front panel is on, there is voltage on the +5 volt output.
2. If the rear fan is working, there is voltage present on the +12 volt output.
3. If the front fan is working, there is voltage present on the −12 volt output.

NOTE

Release 3.1 boxes or later operate both fans from the −12 volt output.

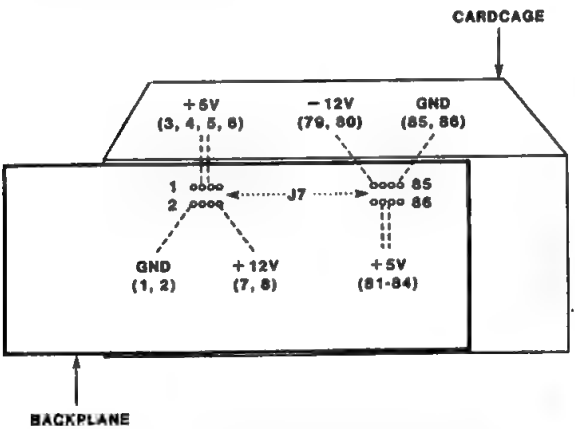


Figure 11-1. DC Voltage Measurement Locations

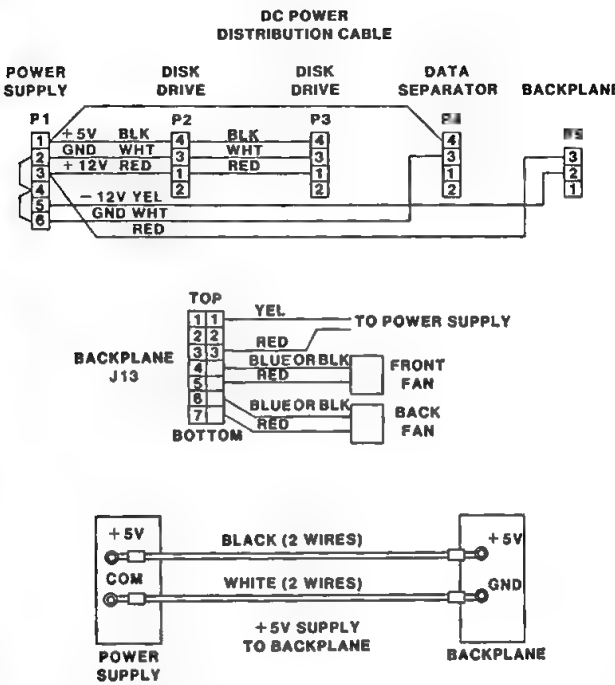


Figure 11-2. DC Power Distribution Diagrams

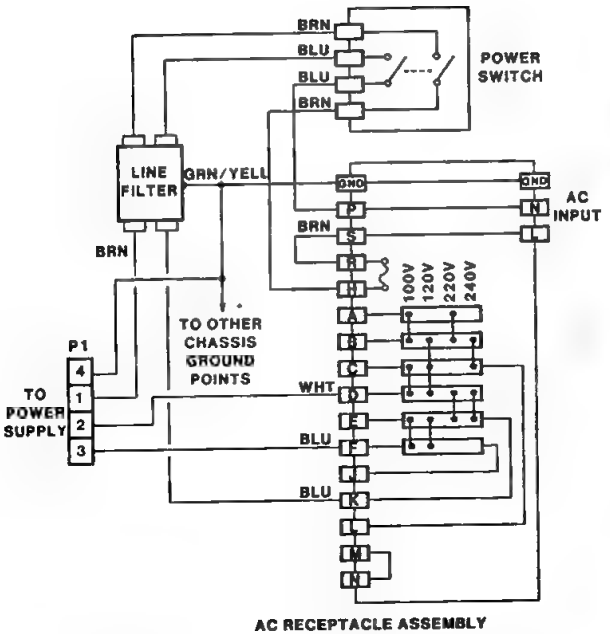


Figure 11-3. AC Power Distribution Diagram

12.1 System Manuals

System Administrator's Installation Guide, order no. 135823
Introduction to the System 310 Microcomputer, order no. 173202
System 310 Installation and Operation Guide, order no. 173211
System 310 Hardware Integration Guide, order no. 173203
System 310 Processor Configuration Guide: iSBC® 86/30 Single Board Computer, order no. 173205
System 310 Processor Configuration Guide: iSBC 286/10 Single Board Computer, order no. 173442
System 310 Memory Configuration Guide: 86-Based Systems, order no. 173206
System 310 Memory Configuration Guide: 286-Based Systems, order no. 173443
System 310 Disk Configuration Guide, order no. 173207
System 310 Hardware Maintenance Manual, order no. 173208
System 300 Series Diagnostic Software User's Guide, order no. 173477

12.2 Hardware Reference Manuals

These manuals describe the individual components that may be used in the System 310 microcomputer.

Processor Board Manuals

iSBC 86/14 and 86/30 Single Board Computer Hardware Reference Manual, order no. 144044
Guide to Using the iSBC 286/10 Single Board Computer, order no. 146271
iSBC 86/14 and 86/30 Hardware Reference Manual Change Notice, order no. 144052.
iSBC 304C ECC Multimodule Board HRM , order no. 122153
iSBC 309 Memory Management and Protection Multimodule Board HRM, order no. 144686
iSBC 337 MULTIMODULE™ Numeric Data Processor Hardware Reference Manual, order no. 142887
iSBC 286/12 HRM, order no. 147533

Memory Board Manuals

iSBC 016A/032A/064A/028A/056A RAM Board Hardware Reference Manual, order no. 143572
iSBC 028C/056C/012C RAM Board Hardware Reference Manual, Order no. 145183
iSBC 028CX/056CX/012CX RAM Board Hardware Reference Manual, order no. 145158
iSBC 12/010/020/040 EX RAM Boards HRM, order no. 147783
iSBC 028CX/056CX/012CX RAM Board Hardware Reference Manual Change Notice, order no. 146094
iSBC 012B RAM Board Hardware Reference Manual, order no. 112748

Communications Board Manuals

iSBC 544 Intelligent Communications Controller Board Hardware Reference Manual, order no. 980616

Peripherals Manuals

iSBC 213 Data Separator Kit Installation Guide, order no. 146232

iSBC 214 Peripheral Controller Subsystem HRM, order no. 134910

iSBC 215 Generic Winchester Disk Controller Hardware Reference Manual, order no. 144780

iSBX™ 217C Magnetic Cartridge Tape Interface MULTIMODULE Board Hardware Reference Manual, order no. 146704

iSBX 218A Flexible Diskette Controller Board Hardware Reference Manual, order no. 145911

5.25-inch Winchester Disk Drive (CMI) Service Manual, order no. 133252